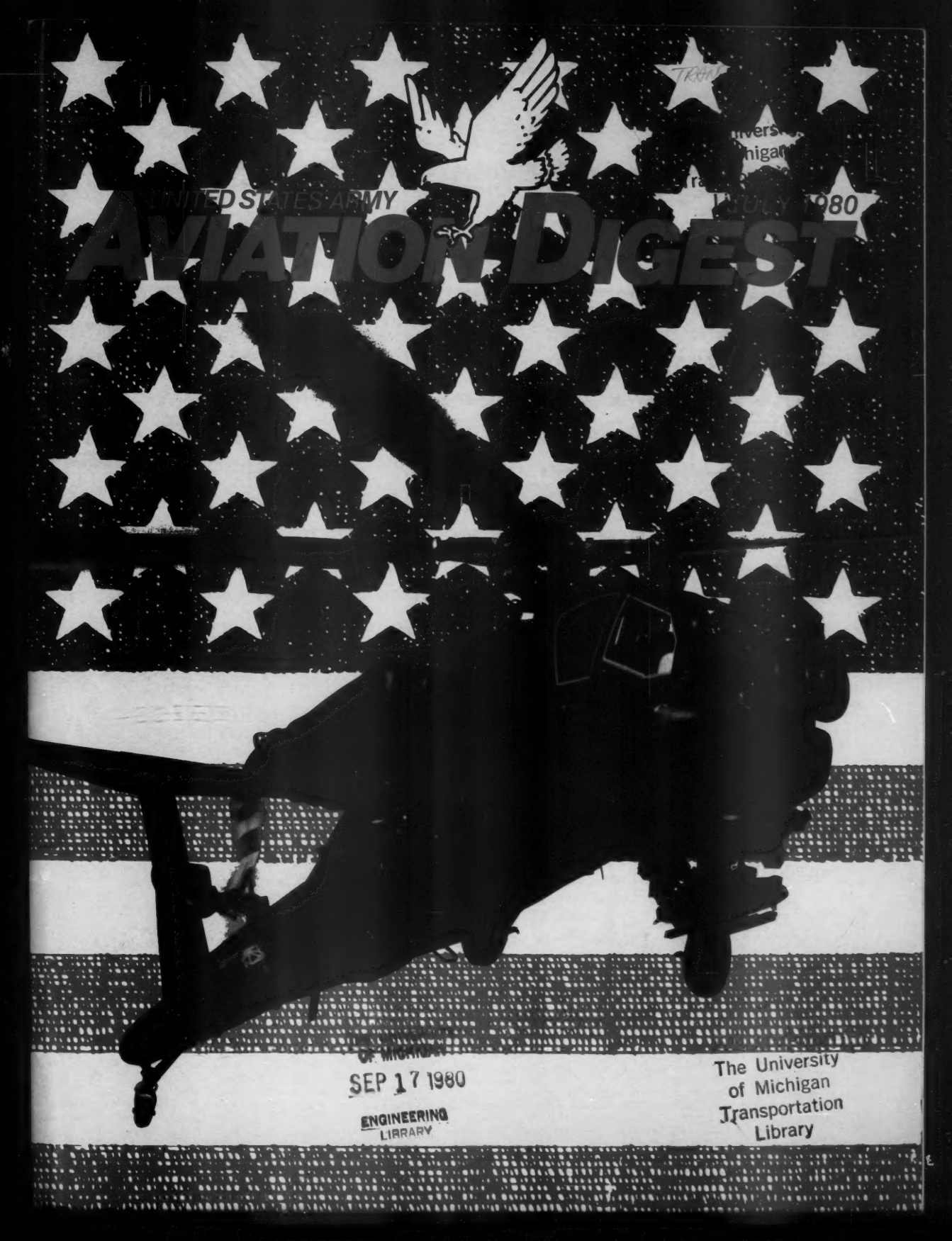

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JULY 1980 • VOLUME 26 • NUMBER 7

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Richard K. Tierney
Editor

The mission of the ***U.S. Army Aviation Digest (USPS 415-350)*** is to provide information of an operational, functional nature concerning safety and aircraft accident prevention, training, maintenance, operations, research and development, aviation medicine and other related data.

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AN AVIATION BRIGADE FOR THE 9th INFANTRY DIVISION

As most of you know, the Army during the past year has been deciding how our divisions and corps should be organized in the future. The study effort is called Army 86. As a result of the Army 86 analysis it is becoming apparent that divisional and corps aviation assets should be organized into brigades in order to maximize the contributions that Army Aviation can provide on a future battlefield. We call this new organization the Air Cavalry Attack Brigade or ACAB. In addition to its improving aviation's combat potential it also will provide an aviation command structure similar to the other combat arms and aviation elements of other services. This will go a long way in providing a viable career pattern for our commissioned and warrant officers. To implement the ACAB concept, the Army Chief of Staff has recently approved a message informing appropriate major commands that the Department of the Army staff, working with Training and Doctrine Command, Forces Command, and Army Materiel Development and Readiness Command, has been directed to develop a plan for organizing an ACAB in the 9th Infantry Division (ID) at Ft. Lewis, WA. This will provide the 9th ID with increased combat potential and will be one of the initial stages in developing the 9th Infantry Division as a "high technology" test bed division where the Army will evaluate proposed organizations and operational concepts.

Major General James H. Merryman
Commander, U.S. Army Aviation Center
Fort Rucker, AL

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A half moon glistens through the broken overcast sending moonbeams dancing across the freshly fallen snow silvering the countryside. Carried by the chilling north wind, smoke rises gently from the chimneys of the slumbering village below. All is calm; all is bright. It is Christmas Eve.

The serenity of the moment is abruptly shattered as hundreds of enemy vehicles cough, wheeze and come to life all along the front. Their noisy tracks soon begin to scar the soft, smooth blanket of snow. The Christmas spirit has fled, the enemy has begun to move. Is this an extension of his winter exercises or the beginning of hostilities? It could be either and we prepare once more to meet his challenge.

My field glasses enlarge the valley before me as the luminous face of my Army watch glares 0300 hours. A bone-chilling whistle alerts me to the imminent impact of incoming artillery fires. Shock and fear, followed by awe, frustration and anger, surge through me as the devastating artillery fires destroy the fragile beauty around me.

Enemy high performance aircraft streak by at low level through preplanned creases in the blanket of artillery fires. Our covering force units begin to deploy, hampered by darkness, bitter cold, and noncombatants trying to escape the bombarded area. Hordes of enemy armored vehicles begin to cross the international border in simultaneous attacks. Aviation units of our covering force bring long-range fires to bear on the enemy. Our artillery fires and Helicopter Launched Fire and Forget (HELLFIRE) missiles force the enemy into assault formation and reduce his rate of advance.

A C

AIR CAVALRY AT

Maj. Albert R. Stewart
Directorate of Combat Developments
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Fort Rucker, AL

In order that you might not have to ponder the questions asked in the scenario above, many are being considered in "Army Studies 86." Innovative ground and aviation organizations are being designed to maximize the contribution of advanced weapons systems and to organize effectively to meet the challenges posed on the highly lethal and fluid battlefield of the future. One of these exciting new organizations is the Air Cavalry Attack Brigade, or ACAB, which will provide many improvements over current organizations and will have significant impact on the future of Army Aviation.

Before we launch into ACAB organizational diagrams, a quick synopsis of Army Studies 86 may put the ACAB concept in better perspective. The Army's first major force structure analysis since the early 1960s, Army Studies 86 is really a set of concurrent studies on the light and heavy divisions, corps and echelons above corps with follow-on studies scheduled for the

More enemy aircraft approach, both helicopters and fixed wing. Anticipating their attack, I brace for the impact of rocket and cannon fires. To my surprise they never come and the aircraft quickly bypass us and continue westward, to what objective I can only guess.

I can now see the assault formations of enemy tanks as they top the rise to my front. I call for preplanned fires.

An overwhelming tide of enemy armored vehicles continues to advance despite heavy losses. Soon I must move or lose my freedom to maneuver, but I hate to leave the security of my prepared position. My spirits rise as I hear the whine of the aerial scouts screening for me, and I know that attack helicopters are providing overwatching fires to cover my movement. It's now apparent. I am facing the enemy's main attack. Quickly, I close into my second battle position, and the helicopters slide away into the darkness.

Hard upon their departure come the inevitable questions. Will other ground and aerial systems provide me the information I need to effectively "see the battlefield"? Are the attack helicopters being relocated to assist in blunting the enemy's main attack? Who is countering the enemy's rear area assault which could be landing in the division support command area by now? Could the reconnaissance squadron coupled with an attack helicopter battalion find and fix the enemy's air assaulting forces? Will my ground means resupply me fast enough or will helicopters have to supplement the ground systems? If I'm wounded, God forbid, will aeromedical evacuation be available?

A B

TACK BRIGADE

airborne and air assault divisions. Since the studies are so interrelated, changes in any organization might have a ripple effect; therefore, they are being conducted concurrently to ensure proper interface of interrelated functions at the various levels of command. Each of these studies is a fast-moving train and the organizations currently proposed may change during the iterative process of the studies.

The organizations summarized below, though not the final products, provide an overview of where we are in each of these studies and the aviation organization. It should be noted that these organizations are being evaluated on the basis of quantitative analysis tempered by military judgment.

The Light Division 86 Study is a refreshing new approach to integrate high technology into a force that can be rapidly deployed and still retain sufficient combat power. Figure 1 shows how the Light Division for 1986 may look.

There are three brigades—two brigades with mobility provided by some type of wheeled armored personnel carrier (APC) and one airmobile brigade. The division artillery has two battalions of 155 mm towed artillery, one battalion of 105 howitzers, a target acquisition battalion and a battery of multiple launcher rocket systems (MLRS).

Our analysis indicated that current aviation organizations could not fully exploit new systems so the Air Cavalry Attack Brigade, or ACAB, was developed (figure 2). We soon discovered

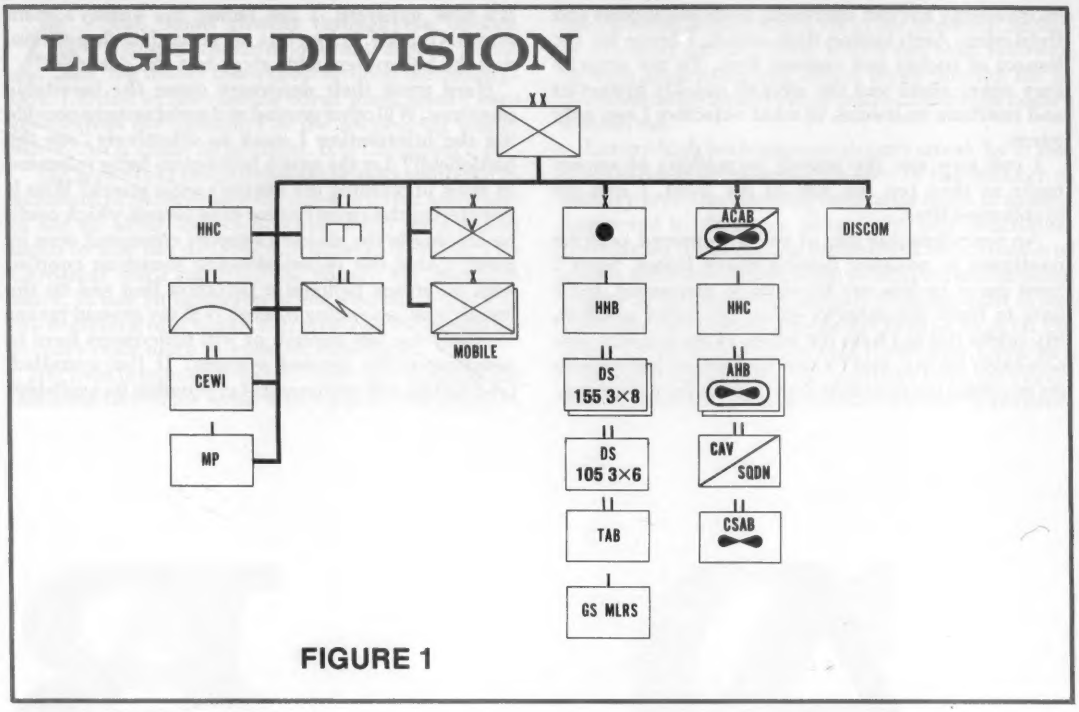


FIGURE 1

that significant additional benefits could be realized with the new aviation organization. In comparison to current organizations, the ACAB provides the division added *"combat power, improved tactical flexibility and enhancements in command and control."*

The Air Cavalry Attack Brigade concept puts all division aviation in the brigade by placing the reconnaissance functions under the cavalry squadron, consolidating support functions under the combat support aviation battalion (CSAB) and putting the fighting elements under the attack helicopter battalions.

Reconnaissance and surveillance for the division is performed by the cavalry squadron. It consists of a headquarters and service troop, two ground troops and two aerial troops. Mobility for the ground troops is provided with cavalry fighting vehicles and motorcycles.

The combat support aviation battalion provides aviation assets in support of command and control, scout aircraft for the division artillery, special electronic missions to support the division's communications electronics warfare intelligence (CEWI) battalion, and utility aircraft for movement of Soldiers, supplies and equipment. The need for aerial lift capability in the Light Division is well recognized, and current alternatives either place one combat support aviation company (CSAC) in the division or provide additional capability at corps to address this requirement.

Attack battalions are the primary fighting elements of the ACAB. Their mission is to destroy enemy armor and mechanized forces using fire and maneuver as an integrated member of the combined arms team. The six attack helicopter companies of the two attack battalions provide flexibility to rapidly meet changing mission requirements. One significant difference from current attack helicopter organizations is the consolidation of aviation unit maintenance into the headquarters and service company of the attack helicopter battalion.

Since its initiation in September 1978, the Heavy Division 86 Study has been intensively managed. The iterative process of organizational development used during the study produced many alternatives but eventually led to the development of building-block aviation organizations used in all Army 86 studies. The ACABs as proposed in the studies for the Heavy and Light Divisions appear identical with one possible exception. The Light Division might include an additional CSAC to address the increased aerial lift requirement of the Division.

ACAB

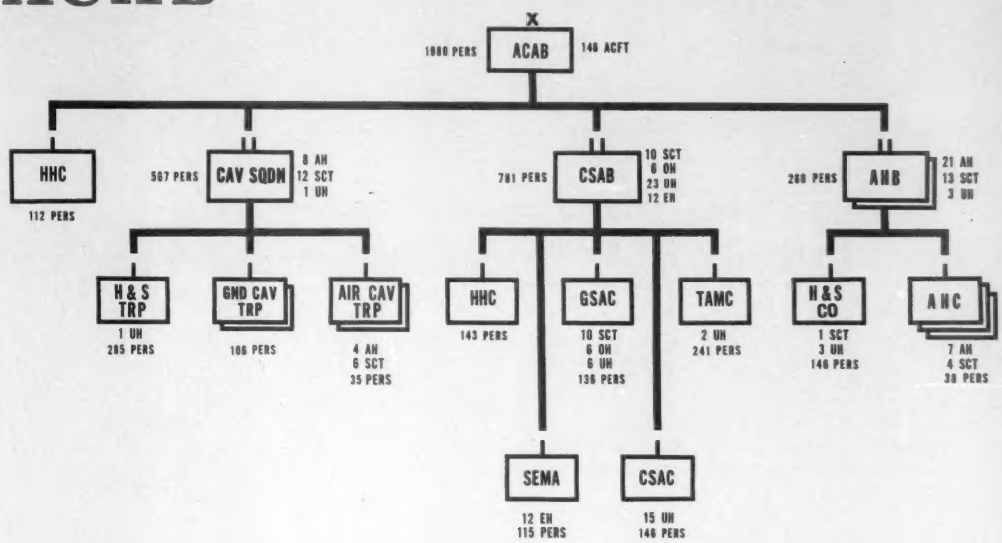


FIGURE 2

HEAVY DIVISION

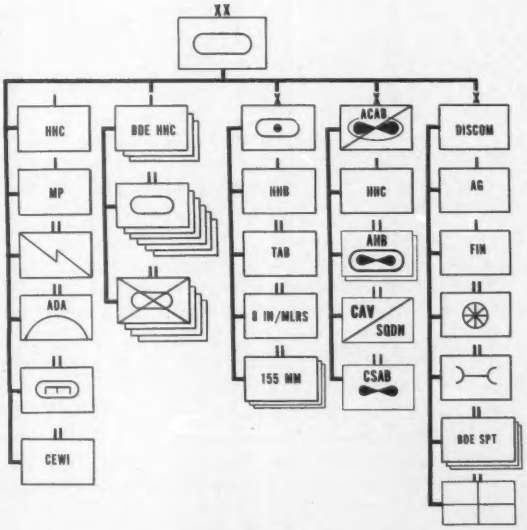


FIGURE 3

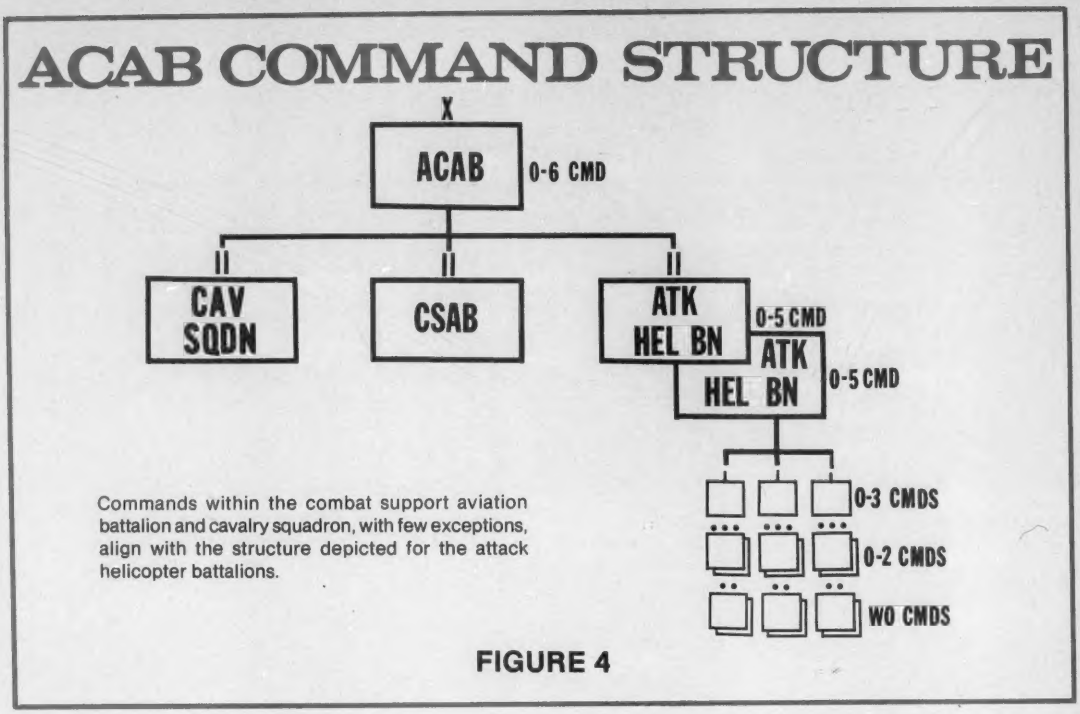


FIGURE 4

The Heavy Division as currently proposed consists of two armored brigades, a mechanized brigade, a division artillery, a division support command and other elements as indicated at figure 3.

Armor and mechanized brigades follow the 4-3-4 battalion concept (four companies per battalion, of three platoons, with four tanks or infantry fighting vehicles (IFVs) per platoon). The division artillery will have three 155 mm battalions, a target acquisition battalion and an 8-inch/MLRS battalion.

In October 1979, the Corps 86 Study was started and is being aligned with the divisions and echelons above corps. Many interservice studies such as the Joint Suppression of Enemy Air Defense have an impact on the corps study. The corps aviation structure has not yet jelled, but some restructuring appears likely in view of emerging concepts.

Echelons Above Corps (EAC) 86 Study was begun in December 1979 and is being conducted in two phases. Phase I is to ensure proper interface with the divisions and corps of 1986. The EAC concepts and organizations are currently in the embryonic state. Numerous requirements are being identified, and aviation units should be better defined following general officer workshops scheduled later this summer. Phase II of the EAC Study will refine the organizational structures, determine cost and training impacts, and develop a transition plan.

The ACAB of Army Studies 86 was designed to exploit our equipment capabilities on the future battlefield, but it also provides a highly significant bonus. It will go a long way toward establishing *a viable career pattern for commissioned and warrant officer aviators.* The ACAB establishes a logical aviation grade structure from section through brigade level which aligns Army Aviation command structure with that of the other combat arms and aviation elements of other services (figure 4). LTCs command battalions/squadrons; CPTs command companies; LTs command platoons; and WOs command sections.

Army Studies 86 and the ACAB certainly won't solve all our problems, but they should provide significant improvements in our future organizations, thus ensuring that aviation continues to maximize its contributions as a fully integrated member of the combined arms team.

We hope that the beauty and serenity of a future holiday will never be shattered by the hideous realities of war, but if it is, we will be much better prepared as a result of "Army Studies 86."

MAST ANNIVERSARY

MAST SITES

	Installation	Established
1	Fort Sam Houston, TX (San Antonio)	July 1970/Army
2	Fort Carson, CO (Colorado Springs)	August 1970/Army
3	Fort Lewis, WA (Olympia)	August 1970/Army
4	Mountain Home AFB, ID (Mountain Home/Boise)	September 1970/Air Force
5	Fort Bragg, NC (Fayetteville)	January 1974/Army
6	MacDill AFB, FL (Tampa)	January 1974/Air Force
7	Fort Sill, OK (Lawton)	February 1974/Army
8	Fort Riley, KS (Junction City)	February 1974/Army
9	Fort Jackson, SC (Columbia)	March 1974/Army
10	Fort Rucker, AL (Dothan)	April 1974/Army
11	Fort Stewart, GA (Savannah)	May 1974/Army
12	Fort Ord, CA (Monterey)	May 1974/Army
13	Fort Knox, KY (Louisville)	May 1974/Army
14	Fort Benning, GA (Columbus)	May 1974/Army
15	Fort Hood, TX (Killeen)	September 1974/Army
16	Plattsburgh AFB, NY (Plattsburgh)	September 1974/Air Force
17	Schofield Barracks, HI (Honolulu)	September 1974/Army
18	Fort Campbell, KY (Clarksville, TN)	November 1974/Army
19	Fort Bliss, TX (El Paso)	December 1974/Army
* 20	Fairchild AFB, WA (Spokane)	December 1974/Air Force
21	F. E. Warren AFB, WY (Cheyenne)	May 1975/Air Force
22	Fort Polk, LA (Alexandria)	January 1976/Army
23	Houston, TX	February 1977/Army Reserve
24	New Iberia, LA	March 1978/Army Reserve
25	Portland, OR	July 1978/Air Force Reserve
* 20	Spokane, WA	December 1978/Army National Guard
26	Cleveland, OH	February 1979/Army Reserve
27	Hill AFB, UT (Ogden)	May 1979/Air Force
28	Worcester/Chicopee Falls, MA	May 1979/Army National Guard
29	Fort Wainwright, AK (Fairbanks)	October 1979/Army

*Units support 1 site—cover same geographical area.

Information for this article was provided by LTC Frank E. Gilliam Jr. who was assigned to the Office of the Deputy Chief of Staff for Operations and Plans, Department of the Army. He is now en route to an assignment as commander of the 128th Combat Support Hospital, United States Army, Europe

MAST (Military Assistance to Safety and Traffic) is 10 years old this month. In that decade military aeromedical evacuation and rescue helicopter resources have been used in more than 18,500 missions involving about 43,000 flight hours.

The Secretary of the Army, as designated by the Secretary of Defense, acts as the executive agent for approving and monitoring the use of defense resources, including Reserve Components, in this role.

MAST is an outstanding and durable example of military and civilian community cooperation. The civilians benefit from the life-saving service, and the supporting military unit receives the opportunity to maintain mission proficiency under conditions which cannot be duplicated in a training environment. The public relations value of the program is inestimable, and it is not unusual for strong personal relationships to develop between members of the MAST-support unit and the communities it serves.

It is a federal program in which the taxpayer can see tangible results. One of those "results" is that MAST does not require additional tax dollars, nor does it result in any direct cost to the people who are helped by it.

The reason for the success of the MAST program over its first 10 years is the dedicated personnel who are assigned to the helicopter ambulance and rescue units. They cared about saving the life of an injured backpacker in a remote area of the Colorado Rockies and a critically ill premature infant in a small community hospital in southwest Texas—and they'll care about the people who need them in future decades.

(For previous MAST articles in the *Aviation Digest*, see the December 1970, July 1971, November 1972, January 1974, May 1975 and February 1975 issues.)

General Kinnard when he commanded the 11th Air Assault Division. Note the division's patch on the general's left shoulder

Airmobility Revisited

part 2

Lieutenant General Harry W. O. Kinnard (R)

Last month General Kinnard reviewed the development of airmobility in the 11th Air Assault Division (T). In this article he looks at Army Aviation today, and down the road, drawing on what he learned when he commanded the 11th and then the 1st Cavalry Division (Airmobile)

THE SUCCESSFUL tests of the 11th Air Assault Division (T) at Ft. Benning, GA, culminated on 1 July 1965 with the establishment of the 1st Cavalry Division (Airmobile). We began deploying the 1st Cavalry to Vietnam a month later and in a short time were proving the combat effectiveness of our airmobile division with its 434 organic aircraft (see *Aviation Digest,* August 1965). We went into combat with a wealth of knowledge we had gained from testing the 11th Air Assault Division.

In the 11th AAD we developed an understanding of the implications of units relying primarily on organic aircraft by studying a series of battles from past wars. We replayed them with our new capabilities. We tried these first with only our side having helicopters and then with both sides. (It was much more fun when only our side had them.) All sorts of implications jumped out of these studies. First and foremost was the almost incredible ability to mass our forces in space and time over very large distances and essentially independent of the terrain. This capability had great possibilities. To me the most interesting was the idea that with our kind of force we could focus more on an enemy force and less on the terrain than any known Army unit. Further, even though the enemy might achieve surprise and enjoy initial superiority in forces and firepower, our ability to mass permitted a rapid turning of the tables. This in my view was at the heart of our Army's successes in Vietnam. The Viet Minh had defeated a well trained, well equipped, *ground-bound* French force in the early 1950s. And they did it primarily by excellent intelligence and meticulous preparation which normally permitted surprise attacks with superior force on French positions. Relief columns, moving overland, were typically too late, or themselves ambushed.

By contrast, against the later counterpart of the same enemy, in the same terrain and weather our Army was able to defeat the Viet Cong even when the enemy achieved surprise and initial superiority. The speed and freedom from terrain of the helicopter let us quickly turn the tables on the enemy by developing superior combat power in the area of decision. And it is my firmest conviction that had we but been released to carry the war into North Vietnam we could have forced the enemy to fight a largely conventional defensive war. Then our superiority in firepower, mobility and logistics would have given him a choice between annihilation and surrender.

UH-1 Hueys deploy 1st Cav troops

Again returning to our testing and analysis in the 11th AAD, we early learned that against any enemy possessing radars we must operate at that lowest of low levels called nap-of-the-earth. We further learned that operating against optical detection (or optically layed guns), helicopters properly employed at NOE make out very well. Related to this was our finding that high performance aircraft have great difficulty in detecting helicopters which are flying NOE.

As to another threat, hostile helicopters, we did some thinking and some testing. We concluded that our helicopters were the best, and possibly, the only viable weapons systems against hostile heliborne raids or incursions. Similarly we felt that if enemy helicopters were present in numbers in our areas of operation they would greatly hinder us. But in truth we were not thinking in terms of really advanced attack helicopters or gunships (for none existed). Were I doing such testing and analysis today, enemy helicopters would be among my greatest concerns—more on this later.

At any rate, out of all this we concluded that our most difficult and important chore was to avoid, delude, degrade or destroy hostile antiaircraft weapons especially those with radar detection and fire control. Other assigned missions must necessarily await some degree of success in this primary requirement. And every available means within the combined arms team and in support services should

Glossary

AAD	air assault division	HELLFIRE	Helicopter Launched Fire and Forget
AAH	advanced attack helicopter	MASSTER	Modern Army Selected System Test, Evaluation and Review
ARM	antiradiation missiles		
AVRADCOM	Aviation Research and Development Command	mm	millimeter
		NOE	nap-of-the-earth
DOD	Department of Defense	TOW	tube-launched, optically-tracked, wire-guided
ECM	electronic countermeasure		
FEBA	forward edge of the battle area	TRICAP	triple capability
		WW	World War

be used to surprise, suppress or destroy radar controlled antiaircraft weapons. This stripping out of the most dangerous threat to our operations pointed up a need for new or modified equipment such as:

- Antiradiation missiles capable of being launched from helicopters.
- Radar warning devices to be installed in some or all of our aircraft to let us know when we were being painted by enemy radars, when their radars had locked on, and hopefully, indicate range and directions to the hostile radar.
- Various forms of electronic countermeasures to jam, confuse or degrade hostile radars.
- A much better standoff, point target weapon than the cantankerous and highly inaccurate SS-11 wire-guided missile. This requirement also was very clear with respect to our ability to engage enemy armor. Some means were already in being such as our organic direct and indirect fire weapons, ECM, ARM and other capabilities in the Air Force, Navy and Marines. Here the need was for quick accurate location and identification of the hostile radar controlled weapons and an accurate hand-off and good communications for placing fires on them.

The modification of ARM compatible with helicopters hasn't yet happened, but it is certainly feasible, for example with a modified HELLFIRE missile. We very much need such a weapon. Radar warning devices are in being but still lack accurate ranging capability. We are working on ECM but are still playing catch-up with the Soviets. The introduction of TOW missiles compatible with helicopters gave us a much superior replacement for the SS-11 and made helicopters so equipped able to deal not only with such radar controlled weapons as the formidable ZSU-23-4 but also made helicopters more than a match for tanks. The continuing improvements to TOW are important and should continue until we can provide a true launch and leave weapon so that our birds are not exposed during the time of flight, as with TOW. This launch and leave missile should have the capability of homing on a target through smoke or other obscuration.

Upcoming HELLFIRE offers a big start in the direction of launch and leave and the promise of derivative capabilities that fully meet our needs. HELLFIRE also possesses a capability which I find of great interest—its ability for indirect fire from defilade positions. This suggests the possibility of launch from ground vehicles, but of greater interest in my mind the possibility of using a high performance utility helicopter like the UH-60 Black Hawk as a launching platform. With some developmental work and not too much money we should be able to develop such a capability. I was delighted that Congress saw fit to earmark money to demonstrate such a capability. My only fear is that Black Hawk mounting HELLFIRE will be regarded by the Army as a threat to the AAH program. But what I envision is the Black Hawk in a purely supportive role, using indirect fire for the most part. I see the requirement as one of minimum modification to Black Hawk such as hardpoints (highly useful also for other missions such as mine dispensing) and with the minimum built-in, maximum strap-on equipment to permit firing HELLFIREs. This capability on all, or a portion, of our Black Hawk fleet would give our commanders a most useful additional antiarmor capability for surge situations in which killing tanks or enemy air defense vehicles becomes more important than other missions of the UH-60 for a period of time.

Next to radar controlled antiaircraft weapons our analysis indicated infrared homing missiles like Redeye were our second most serious threat. In this area we had few concrete thoughts about how to defeat the threat except to deny observation by NOE flight and by quickly bringing fire on the potential or actual launchers. Fortunately our technical people were already working this problem with systems both passive and active being quickly developed and fielded. These solutions came largely from the group of dedicated people in AVRADCOM working across the board with industry on protective systems for helicopters. Their efforts have been exceptionally productive and important and should continue full speed ahead.

At any rate my overall conclusion is that we now have a capability (and one which is constantly improving) to so degrade enemy ground based antihelicopter weapons as to permit not only the survival of our airmobile forces but to survive with the ability to be a major *(perhaps the major)* factor in defeating enemy armored

. . . we could focus more on an enemy force and less on the terrain . . .

formations. In this regard the Mideast War of 1973 produced many so called lessons learned by our Army. One was expressed in those hallowed words that "the best defense against a tank is another tank." As one who has studied that war, visited the battlefields and talked with Israeli commanders (as I had also done after the Six Day War of 1967), I feel that lesson was probably true only because there were no TOW equipped helicopters on either side. Had there been I feel the lesson learned would clearly have been that there is a better way to kill hostile tanks.

I indicated my belief that we can now cope with enemy ground based antihelicopter weapons (but only if we carefully work out all the details and ensure precision execution by constant practice). But a new, in my view deadly, threat has appeared on the scene and gained prominence in Afghanistan. I refer, of course, to the Soviet helicopter force which, according to ***Air Force*** magazine of March 1980, "now numbers more than 5,000 units—(with) special emphasis on ground attack helicopters—. Several new, high performance designs are now entering the [Soviet] inventory and can fire launch and leave weapons from standoff positions." Of the many types of Soviet helicopters the two of greatest significance for the point I am developing are the Mi-8 HIP and the Mi-24 HIND.

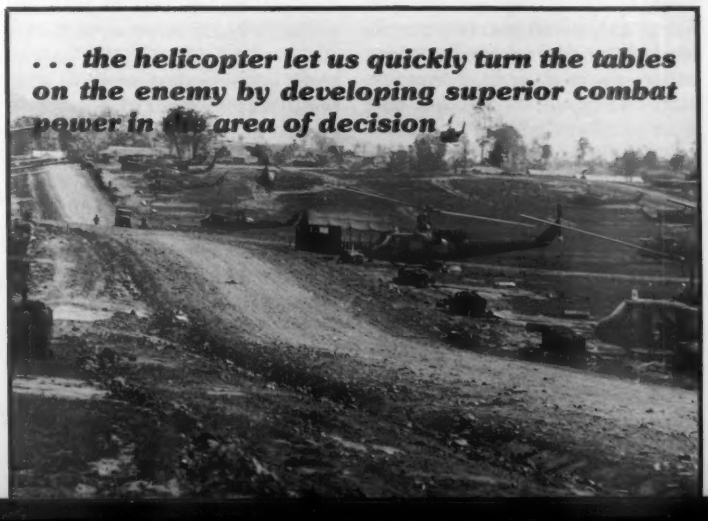
The HIP is covered in depth in this month's threat section on page 42. But it is interesting to note here that total production for military and civil use is thought to be about 750 per year. The HIP-E can carry up to 192 rockets plus four SWATTER infrared homing antitank missiles. HIP-F is the export counterpart of HIP-E with missile armament changed to six SAGGERs.

The HIND is a newer and more formidable helicopter than HIP. It incorporates structural hardening by substitution of steel and titanium for aluminum in critical components. Glass-fiber skin rotor blades also replace the original blade-pocket design. HIND was originally designed as a squad carrying assault transport. Armament has been added and increased dramatically over time to include rockets and air-to-surface missiles. Today the HIND is up to models D and E though HIND-D is best known.

According to information contained in ***Air Force*** magazine, March 1980, the HIND-D boasts a redesigned front fuselage for a primary gunship role. This gives tandem positions to the weapons operator (in the nose) and the pilot—each with his own canopy—and with the pilot's seat raised for an unobstructed forward view. A probe, fitted forward of top starboard corner of the bullet-proof windshield at extreme nose, is probably part of a low airspeed sensing device to permit optimum dispersion for 57 mm rockets. Under the nose is a four barrel Gatling-type machinegun in a turret with a wide range of movement. An undernose sensor pack possibly includes radar and low light level TV. Wing armament of the HIND-D (32 round packs of 57 mm rockets, or bombs; four SWATTER infrared homing antitank missiles) is retained. The HIND-E is the same as D but with four AT-6 SPIRAL antitank missiles instead of SWATTERs plus additional structural hardening. Deliveries of all models of HINDs are thought to exceed 1,000 with production at 30 per month. Full regiments of these aircraft have been based at Parchim and Stendal, northwest and west of Berlin since 1974.

So the point is the Soviets have many helicopters, they have good helicopters and they have embraced the idea of hardened gunships mounting very formidable armament which some people believe could include air-to-air missiles. These gunships can carry troops in their cabins for raids, etc. Further, the Soviets are extensively exporting only slightly less capable helicopters to many countries.

Finally, there is growing evidence in Soviet military literature that they intend to reestablish Army Aviation. Phillip A. Petersen, an analyst for the Defense Intelligence Agency, in his recent article "Flexibility: A Driving Force in Soviet Strategy" (***Air Force*** magazine, March 1980), discusses this possibility at length



Left: Soldiers of the 1st Cavalry Division (Airmobile) unload a CH-47 to begin search and destroy mission in Cay Giep Mountains, Vietnam, 1967. Right: The "golf course," parking and assembly area for helicopters of the 1st Cavalry Division (Airmobile) at An Khe, Vietnam, 1966

and concludes that helicopters are not now organic to Soviet ground forces. He goes on, however, to indicate that the Soviets are recreating an Army Aviation force and may be moving toward a doctrine that at least extends some wartime operational control over combat helicopters within the front organization to the combined arms or tank army commander.

I feel that Soviet armed helicopters would be a more formidable threat if organic to Soviet ground forces, but even if retained in their air forces they must be regarded as a new, deadly factor in the combat equation. And whatever the current Soviet doctrine may be regarding the use of their armed helicopters as antihelicopter weapons systems, it seems very obvious that such use will become a significant threat. The possible inclusion of air-to-air missiles in their armament certainly would support this idea.

So the history of air warfare as developed by fixed wing aircraft is repeating itself. Initially the aircraft on each side went about their functions with little regard to enemy aircraft. This all changed when some pilot first fired a round from some weapon at a hostile aircraft. The idea of defending yourself and destroying the enemy aircraft became a preoccupation. Out of this grew a doctrine, still dominant in our Air Force, that some degree of air superiority, at least ad hoc in a certain airspace, must be achieved to permit other missions (reconnaissance, close air support, interdiction, etc.) to be performed without prohibitive losses. It is the simple, very old idea of dealing first with the most deadly threat. Certainly, prior to the advent of recent generations of surface-to-air missiles, armed hostile fighter aircraft were the most deadly threat to our Air Force. That is now arguable, as it also is debatable whether the greatest threat to our helicopter operations is ground based antiaircraft weapons or hostile armed helicopters with air-to-air weapons. Until helicopter vs. helicopter engagements have been fought this must remain conjecture. My own guess is that enemy helicopters will be the more serious threat primarily because they alone match our unique mobility and thus can be where we are. Second, I feel they are less susceptible to orchestrated combined arms defeat than are the ground based antiaircraft systems.

I therefore believe that like it or not we must take a leaf from the Air Force history book and perforce assign top priority to gaining a degree of superiority over enemy armed helicopters in our area of operation. This does not mean at all that we want to become "fighter jocks" with our scarves fluttering from our necks. *Our primary job is to defeat tanks and other ground forces.* But, like the Air Force, we must be able to do this with acceptable losses so we can continue to fight. Just as we must give priority to stripping out enemy ground based air defense systems, we must now give at least equal priority to defeating enemy helicopters attempting to destroy us.

And similarly we must look for every chance to bring all of our capabilities to bear in defeating enemy helicopters. This orchestration will be at least as difficult, probably much more so, than that aimed at defeating hostile ground based antiaircraft systems. In addition to what all other friendly forces can do against enemy helicopters we need onboard capabilities for our helicopters. Recent Army efforts to adapt STINGER as an air-to-air protective weapon are laudable. I hope we do this quickly and with a view to building up an early capability initially in our scout and attack helicopters and later on a capability for use on an "as required" basis by our utility aircraft.

I also believe we need a better onboard system, with much greater standoff capability, than STINGER. Certain air-to-air systems already in use on Air Force, Navy and Marine aircraft are almost certainly adaptable to helicopters. The size and weight of these systems indicates that for now the preferred carriers would be UH-60 Black Hawks or any model Ch-47 Chinooks now in our inventory. Such systems could be made strap-on with removal quite simple and quick. This is all well tried, in-being, technology and hardware whose testing on helicopters should be actively pursued. When proven, such systems would offer substantial bonuses besides their antihelicopter capabilities. By their design these systems are also capable of engaging high performance aircraft and cruise missiles. As such, they would provide a super-mobile air defense system with these virtues:

- They could be deployed with rapid deployment forces (either in Air Force aircraft, or in some instances self-deployed) to provide a formidable and flexible initial air defense far superior to any weapon now available to such forces in the initial phases of an operation.
- They could act as gap fillers or as thickeners in conjuntion with such ground based systems as Hawk, Roland and Chapparal, for example in Europe.
- They could provide an air defense system having the same mobility as the rest of our forces in airmobile operations.

This last capability, to provide accompanying air defense would be of particular value where our airmobile forces are sent to meet and destroy hostile airmobile forces moving into our territory accompanied by armed escort helicopters. Air-to-air systems would also be most useful when we are making an airmobile incursion into hostile terri-

tory. I know that in many quarters of the Army the idea of helicopter operations across the forward edge of the battle area is regarded not just with distrust and doubt but as being the wild-minded idea of some over zealous aviator. The idea that our helicopters can and must operate only on our side of the FEBA is in fact pretty much accepted doctrine in our Army. I just don't happen to buy it. When I hear Soldiers whose views I respect say that helicopters can't cross the FEBA, I feel they really mean "can't cross the FEBA without losses." With that I do agree. By its nature the FEBA is an unhealthy place and anyone trying to cross it, by any method, is in danger. But I am quite certain that airmobile operations offer the best, fastest and safest means to cross the FEBA. As I attempted to bring out earlier, any such operations would entail carefully orchestrated support from all pertinent friendly forces particularly in dealing with hostile ground-based, air defense systems. The ability of such a cross-FEBA, airmobile force to provide forward observation and homing guidance for various indirectly fired precision munitions would give the airmobile force its own "rolling barrage"—*only better!*

But why is it important to debate the feasibility of cross-FEBA, airmobile operations? Because their potential payoff is so high. I was behind hostile lines three times in World War II. Two times were by parachute (Normandy and Holland) and one (at Bastogne) because the Germans surrounded our force. It was deeply impressed on me that living behind enemy lines can be very good indeed. The quality of enemy units in the rear is usually less and his "goodies" are there for the taking or destroying. This I feel will be especially true of the modern Soviet Army with its mind boggling logistical and communications requirements. And, his almost hub-to-hub artillery is certainly inviting. One aspect of living behind enemy lines that I disliked intensely in World War II was that as parachutists we were compelled to seize and hold and basically to wait for outside assistance in the form of a link-up. Now, however, the capability of the helicopter to move around in the enemy's rear faster and easier than any enemy force (except his helicopters) is a tremendous improvement over the airborne drop. I also came, in the days of 11th AAD testing, to have great respect for the impact of decoy helicopter feints with false troop insertions and so on. An enemy must check out each helicopter landing as we play a rotorborne shell game in his rear areas. (Even the Viet Cong in Vietnam tried to check each landing of choppers.)

If the enemy rear is not a lucrative area why, as a country, are we at such pains and expense to develop exotic ways of damaging him well behind his side of the FEBA? These technical efforts are fine, but for the foreseeable future we should closely examine *not whether, but how* we can cross the FEBA by helicopter and rattle around in his target-rich and vulnerable rear areas.

Harking back once more to 11th AAD days, another area of our intensive interest was the air deployability of our force. It seemed obvious that airlift and self-deployment for our aircraft had to be the name of our game so that we could get to some trouble spot much faster than by seaborne deployment. I spoke earlier of our continuous diet of "airmobile metrecal" to take weight out of our equipment. By such weight reduction we sought not only increased tactical mobility but also greatly improved strategic mobility in requiring fewer (and smaller) Air Force aircraft. We took tons and tons of weight out of the units with which we began our development and test. I remember being very proud that we had made ourselves lighter and required less sorties for aerial deployment than the 82nd Airborne

Airmobility Revisited

Division of that time. Aside from the size and weight reduction we worked hard at the many unique problems of transporting helicopters in Air Force aircraft. We studied disassembly and reassembly; loading and unloading; tie-down requirements; type loads and so on. Most of this was simply adapting to helicopters that which many of us had earlier learned in airborne units. The answer to this is self-deployment, an example being the self-deployment of four CH-47Ds to Germany last year.

To close with one wrap-up plea, I hark back to my speech to the Army Policy Council just prior to my retirement from the Army. Then Chief of Staff General W. C. Westmoreland had asked me to address the council on the topic of future Army weapons systems. But in contemplating the shotgun approach that 30 minutes on that subject would entail I elected to use a rifle and discuss only the future of airmobility. I first reviewed the value I attached to the approach of a Howze Board type analysis followed by a prolonged period of developmental testing such as done by the 11th AAD. I then strongly urged that the Army repeat that approach periodically beginning as soon as possible with developmental testing of the third type organization already suggested by the Howze Board, the air cavalry combat brigade. Emphasis should be on operations in a high intensity European scenario.

I then outlined what I felt were key elements of success in such developmental testing. Essentially as I recall they were these:

- Good people, including an imaginative, energetic commander able to motivate and lead.
- A broad mission type order with lots of latitude for on the spot innovation.
- An across the board goal of producing the best possible organization, doctrine, tactics, techniques, equipment and training using an iterative trial and error approach to test and development.
- Latitude to modify present equipment or procure special equipment plus a fund and procedures to do so easily.
- A good test site (I suggested Ft. Benning, GA.)

I then emphasized my belief that the products of this test organization would require evaluation principally by the exercise of sound military judgment rather than any measured "hard data." I was sure in my own mind that the outcome of our 11th AAD efforts hinged far more on the gut feelings of men like General Earle G. Wheeler, General Harold K. Johnson, General Creighton W. Abrams and Secretary of Defense Robert S. McNamara than it did on any hard data on maintenance, etc., so laboriously captured by the hard working data collectors of the test evaluation and control group which monitored the 11th AAD.

My speech was well received and I was assured my recommendations would be implemented. And in part at least this was the genesis of what later became the testing under various names such as MASSTER at Ft. Hood, TX. Sadly, though, there were too many divergent goals, too many cooks, too many addenda tests and a general watering down of most of the principles I had laid down. It was almost a miracle that an air cavalry combat brigade did somehow emerge from the miasma of TRICAP and the rest (albeit at the expense of the splendid 1st Cavalry Division becoming an armored division).

Most recently there is good news coming from the Army Staff about reinstituting developmental testing at Ft. Lewis, WA, using the 9th Division as the nucleus (see pages 1 and 2 of this issue). You can be sure I will be making my inputs to the extent I am allowed to do so. This time the testing will probably be constrained, as we were not in the 11th AAD, by the requirement to maintain a contingency capability throughout the testing period. Even so, much good development is possible. Best of all the Army is thinking that way again. My great hope is that developmental testing in school units, in regular units, in reserve component units—in every conceivable manner becomes a way of life in our Army.

Whether or not the Army as a whole embraces developmental testing, I highly commend it to Army Aviation as a most worthy precept with great potential payoff toward achieving the ultimate goal—greater combat effectiveness.

I have a firm conviction that Army Aviation possesses the dormant potential to change completely the way armies fight. I believe the only ground forces we can field which have any chance of stopping a full scale Soviet offensive in Europe without recourse to atomic weapons are forces predominately dependent on Army Aviation using the full potential of the airmobile concept. I am even more certain that airmobile forces are by far our best answer to those wide ranging, non-European contingencies calling for what we know today as rapid deployment forces.

You must sense by now my feeling of great potential in our Army Aviation embracing the precepts of the airmobile concept. But whether such potential is realized is by no means foreordained—it depends largely on the minds and wills of those now in service, particularly our aviators, and those to enter service in the future. Were I one of those entering our Army today I would want to be in Army Aviation and take part in helping Army Aviation achieve its full latent capability and thus keep our Army superior to any other in the world.

Photos by PFC Gary Dahn

MONTHLY
WRITING
AWARD
. . . it is imperative that the female accept the responsibility for fair play. To seek acceptance or gain position by feminine wiles is self-defeating
Captain Deborah K. Gilbert

QUITE AN exhilirating thought, that of flying, of being an Army aviator. A singular excitement. The female on her way to flight school has met the requirements, passed tests, been selected and placed on orders. Her thoughts are on the personal adventure that lies ahead, disassociated from uniqueness based on sex. Arrival at Ft. Rucker, AL and the inprocessing days may be like that at any other post for attendance at any other school. However, it soon will become apparent to her that she is a female in a male environment. It is time to adjust. The challenge is assimilation into a traditionally male bastion.

As portrayed on the silver screen and in adventure novels, with his wings glinting in the sunlight and a pocketful of credit cards, a "true" Army aviator assaults the airways with sunglasses, white silk scarf flapping in the breeze, checking his gold Rolex to ensure he is not late for happy hour and a night of carousing. Obviously, but maybe not so obviously, a female is not suited to emulate that caricature, at least not all of it. A woman is not a man, ought not strive to be like men. But she crossed a barrier, a thin gray line, the minute she put on the colored hat designating her class and caught the bus for the flightline. She adjusts. She must find her place. It is assumed that with few exceptions the male student who clambers into the right seat will learn to master the aircraft. Not so with a

woman. She must prove herself. She makes herself fit in a space of preconceived parameters established by eons of social evolution. Not now, nor in the foreseeable future, will aviation be integrated to the point that female versus male controversies will subside, not be a topic of concern, not be looked at by command. Women are outnumbered by too many to count.

The female aspirant seeks acceptance. She wants to be part of her class, a contributor to its camaraderie and activities. Friendship on the sports field, or during happy hour, or in any other social environment might not readily transfer to being a team member in the aircraft. Further, in conversation with male friends about the peculiarities of her adjustment, she may well have a sympathetic ear but it can never be empathetic, going that final measure that a female comrade's ear might. Unfortunately for most, companionship of the same sex is not often possible because there are so few female students, frequently one per class. She must rely on male companionship or none at all. How well can the male counterpart comprehend her unique situation? He is part of the problem—a participant, willing or unwilling. No matter what her efforts, no matter how well thought of she is, she will have a sense of isolation. It is pervasive; however, any female has the potential for being comfortable. Until she resolves any conflict she may have about her assimilation in male-dominated aviation and her handicap of never being fully understood she will not be comfortable. Whether desired or not, she cannot be one of the boys. That is ok. She can be with the boys.

The female is a source of curiosity. "Hey, let me fly with her—I've never flown with a female." Heads will turn, people will stare, she will be interviewed, her voice on the radio will cause a moment's hesitation, she will be a topic of conversation, she will be scrutinized. Further, she will be ribbed, the brunt of jokes. Most often the jests are intended to form a sense of camaraderie but can run the gamut from being boring to enraging. "The men of (this) flight all agreed having women in the flight was a benefit at times. They always knew when checkrides were near by just walking by the girl's room. The thicker the perfume, the closer the ride." Tongue-in-cheek and a bit amusing, for the women were not always afforded a "girl's room" and, of course, everyone knew when checkrides were scheduled for these were always announced. The female will complain about this unsanctioned chauvinism, whether intentional or not, and the unpleasantness of being singled out for whatever the reason. How she ascribes to this singularness will dictate her success in aviation—how well she "instructs" those around her about her expectations will dictate the degree of her integration with other aviators.

Attitude based on sex-oriented adjustments is often the explanation or excuse for performance, either

An Army aviator must never forget to put on the gloves before a helicopter flight

As an officer, commissioned or warrant, she will conduct herself appropriately; as an aviator, she will perform her duties professionally

exceptional or marginal. This attitude cannot be dismissed nor ignored; it must be brought into line, into perspective. It might be tempting for a female to excuse her lack of performance on the rationale that the instructor pilot (IP) does not believe there is a place for women in military aviation. That attitude might well be that of the IP and may well have been verbalized by him or her and be unchanging; however, the acquisition of wings is the goal, not changing attitudes. To excuse poor achievement instead of striving to correct errors and to succeed can prevent attainment of those wings. On the other hand success is frequently attributed to qualities or characteristics other than ability and aptitude, as intimated by the perfume anecdote. Remember, all a student must do is learn to perform the necessary tasks with a skill level that meets or exceeds the standards and that student will become an aviator. Sex is of no consequence. Although the pilots differentiate the pilots by sex, the aircraft does not. The aircraft flies just the same, responds just the same. Finally, it is imperative that the female accept the responsibility for fair play. To seek acceptance or gain position by feminine wiles is self-defeating. Flight school affords the easiest flying the student will do because the responsibility for the safe conduct of the mission and the safe return of the crew sits in the left seat, with the IP. After graduation, when the weather is adverse, approach control is down and the segment lights begin to flicker, when the crew and passengers depend on the pilot-in-command, her smile will not lead the way. The skills for that time must be acquired now.

Once the female has resolved her personal conflict with her uniqueness, she must realize that others have not resolved theirs. She must realize that each and every person she meets whether male or female, rated or nonrated, will become aware of her. She will have to assist each person in resolving their reaction to her, even if she is not affected by that reaction, for she will always be an envoy. It is vital that she never lose sight of this unique obligation. Everyone has questions about her, about women in aviation and in the Armed Forces and will react to her and other women according to her answers and their perceptions. This often unwanted and unwarranted requirement can be burdensome but is necessary for her personal assumption of the role of aviator and for assimilation of other women into aviation. As an officer, commissioned or warrant, she will conduct herself appropriately; as an aviator, she will perform her duties professionally. She may attract attention and evoke reaction but as long as she does her job, is a credit to herself and aviation and makes no special effort to call attention to herself because of her sex, she will become part of the "Huey Team." The objective, the goal to become an Army aviator, to wear those coveted wings should remain paramount; it should never be compromised because of attitudes real or perceived.

Still unaccepted? The problem is theirs, not yours. So, a nice girl like you wants to drive a Huey. Of course.

For information on flight training eligibility see the May 1980 ***Aviation Digest***. page 22 and outside back cover.

About The Author:
CPT Deborah K. Gilbert learned to "drive a Huey" (UH-1 helicopter) in flight school at Ft. Rucker, AL. After she graduated in March 1977 she remained at that installation as a UH-1 instructor pilot, the first woman to have such a position. She has logged 1,500 flight hours, including 1,000 as an IP.

TASVAL Review

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6th Cavalry Brigade (Air Combat)
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the GUN CAMERA

In the March 1980 issue of the *Aviation Digest* the author presented a method of determining range which has limitless potential for application by any Soldier on the battlefield. This was only one of many such refinements developed during the TASVAL test. This article concerns the gun camera, a piece of hardware used throughout the test on all attack aircraft and also on air defense weapons. The system was designed and installed in the aircraft for the sole purpose of post trial assessment of target engagements. Analysis personnel viewed the gun camera video tape to validate computer data when assessing engagements. Portions of the material presented herein pertain to technical aspects of the S model Cobra and may be somewhat confusing to anyone not rated in the aircraft or not familiar with their tactical employment

THE GUN CAMERA'S function is to record all engagements with any weapon fired through the TSU (telescopic sight unit) that the gunner uses. That could be the 7.62 millimeter (mm) minigun, the 40 mm grenade launcher, the 20 mm cannon or the TOW (tube-launched, optically-tracked, wire-guided) missile, with the TSU. The camera records each engagement just as the gunner sees it, and during TASVAL (tactical aircraft effectiveness and survivability in close air support anti-armor operations) was used for TOW missile engagements only. The video tape in the gun camera recorder was on a video tape cassette and ready for immediate viewing when removed from the aircraft.

The training potential for this video tape was recognized very early in the test and a television and tape player were procured and installed in the debriefing trailer. Thus, at the conclusion of each tactical mission, the video tape was immediately reviewed as an integral part of the debriefing.

Because of the gun camera video tape the gunner had no secrets concerning errors on his engagements. At first some of the video tapes were somewhat embarrassing because of poor tracking technique or poor launch analysis, but it was this same embarrassment that induced the weaker gunners to work harder at improvement. All crews viewed each tape and an instructor pilot was selected at each debriefing to debrief and critique each engagement or attempted engagement. From these critiques each pilot was encouraged to offer suggestions and/or recommendations to improve engagements throughout the test.

The gun camera video tape proved exceptionally beneficial in all facets of TOW missile launches from selection of firing positions through range determination validation to the development of three engagement procedures: target selection, target switch priorities and target tracking.

Before discussing these procedures in detail, one point must be raised. A problem peculiar to dry-fire training using the gun camera video tape was the fact that—since there was no missile en route—it was very difficult to assess where the missile was in its flight at any point in time. This point is particularly critical in evaluating the three procedures developed as will be seen later. One method for determining missile location employed by the TASVAL troop was to compute time of flight at various ranges and commit them to memory. Once a target was acquired the gunner would announce the range to the pilot who would begin a verbal countdown at missile launch, in 5-second increments, to key missile impact and missile location.

Target Selection. The term target selection is somewhat misleading. I

AH-1 moving into position

am not referring to the decision as to which target to shoot tactically—that decision must be made prior to our selection problem. What I am referring to is a decision which assesses the likelihood that once the missile is launched the target will remain in the field of view and thus vulnerable to a hit throughout the missile flight. We found that, on occasion, because of folds in terrain or large terrain obstacles visible in the direction of the movement of the target, it was possible to determine that if a missile was launched it would not reach the target before the target became covered or the target would not uncover before the missile passed it or impacted on the terrain obstacle (figure 1).

By using the gun camera video tape it was much easier to evaluate the decision process involved in launching a missile which was a questionable kill. The key in making this decision was merely one of awareness, not becoming so target fixated that the only consideration was shoot if something is seen. It took time to develop this awareness because of the limited time available to unmask, acquire a target and launch a missile. During the test the standard for unmasking and launching never wavered from a maximum of 10 seconds. That is not to say that 10 seconds were never exceeded but the goal was 10 seconds on every attempt. With the assistance of the video tapes each crew improved at a phenomenally geometric rate and even the weaker gunners showed tremendous improvement.

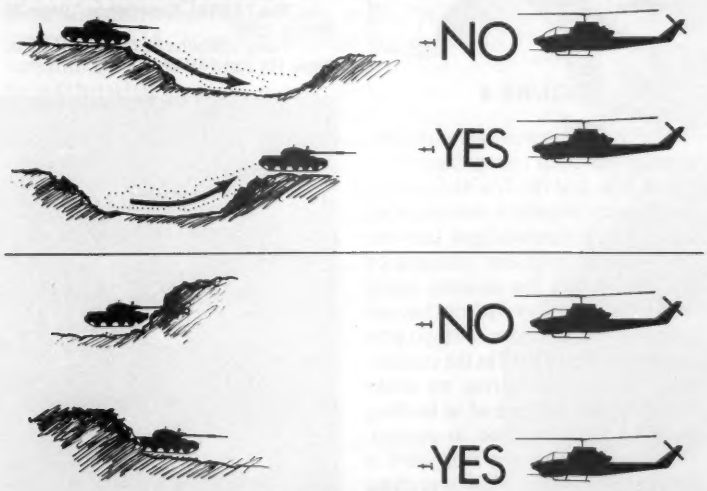


FIGURE 1

Target Switch Priorities. The second technique, which was an off-shoot of the first, concerned a missile already on the wire (launched) for which it was decided the target would become masked and not reappear prior to missile impact on terrain or missile flyby. For these launches, in the target rich environment at TASVAL, it was always possible to switch to another target. The only question that arose was, which target? From this dilemma arose the general rule of going laterally first, then at a greater range and as a last resort to a nearer target (figure 2).

The decision to move laterally assures an in-range shot, assuming the primary target was in range and must be made only if the vehicle is relatively close laterally to the initial target. This decision will be a function of range and the length of time the missile has been on the wire, but generally speaking a lateral shift should be first priority.

Second, the target at a greater range is risky because of the possibility it is out of range, but again it should be in proximity to the initial target. Even with a missile on the wire it will be difficult to determine whether the missile has passed a near target without the risk of losing the missile while visually searching.

Last choice is the nearer target. Again, as is the case with the other two, the decision is still a function of range and the time the missile has been on the wire; but the chance that the missile has not passed the

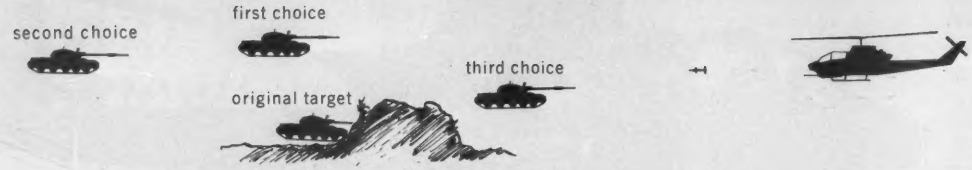


FIGURE 2

nearer target or will not have enough time to complete the lateral shift is prohibitive. There are, of course, a number of good arguments for any number of priorities but those presented here worked and warrant serious consideration by a professional Cobra pilot and gunner.

Missile Tracking. The third technique, missile tracking, involves two situations which would preclude the missile from impacting on the target: first, impacting on an intermediate obstacle and second, loss of the missile's infrared (IR) source because of masking of the missile by an intermediate obstacle. As discussed earlier, there are times when a gunner recognizes that the target will pass behind an obstacle during missile flight. If the gunner can reasonably conclude that the vehicle will unmask prior to missile impact, that is a valid reason to launch. Under these circumstances there is the risk of two things occurring. First, if the obstacle is relatively near the target and the gunner tracks it as recommended, using the motion compensation capability of the system, the missile may hit the obstacle before the target unmasks. A solution to this dilemma which proved highly effective in TASVAL was to move the sight immediately to the other side of the obstacle and merely wait for the target to reappear (figure 3). This technique was effective only so long as the missile had not already flown by the obstacle.

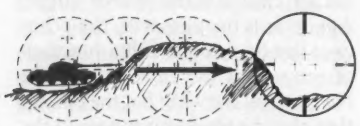


FIGURE 3

Second, if the obstacle is located relatively nearer to the launch site of the missile, there is the possibility that laterally traversing the TSU will cause the missile to track behind the obstacle. When an obstacle obscures the IR source at the rear of the missile for more than .5 seconds, automatic wire cut will occur and the missile will continue to track on the last guidance command it received before the loss of the source. In this instance it is still desirable to move immediately to the far side of the obstacle. In order to retain the IR source of the missile though, the missile was tracked around the immediate periphery of the obstacle (figure 4). This technique assured neither impact with the obstacle nor loss of the infrared source.

FIGURE 4

The training potential for the gun camera has been recognized at Ft. Hood, TX, and the 7/17th Cavalry, 6th Cavalry Brigade is now working with an experimental gun camera. One serious problem recognized thus far is that the camera being used runs continuously from takeoff to the end of the tape, with no provision for turning it off in the cockpit. This means that during en route flight, repositioning and in holding areas, it will continue to record. The most serious problem here is delay in debriefing while searching for each engagement. Any future gun camera should be controlled by the left hand grip on the TSU as an on/off means of control. Even with this problem this camera is still, however, better than no camera but the problem should be corrected in future systems.

During TASVAL the video camera was wired to the TOW trigger which allowed for the video camera to come on at missile launch and shut off automatically at impact.

The three techniques of TOW missile tracking through the TSU were recognized and developed because of the gun camera. This camera has much greater potential for employment in the aircraft for a wide variety of training, and more importantly in all facets of military training, from individual weapons through massive air defense systems.

Previous articles on TASVAL published in the *Aviation Digest:*

- **"TASVAL," page 16, September 1979**
- **"The TASVAL Experience," page 39, March 1980**
- **"Tests, A Means To Train And Learn," page 10, June 1980**

In the past pilots have been taught that their eyes scan the instruments in a circular pattern. Here is data that shows this scan pattern does not exist

Do You Rememember The Saying, "What You See Is What You Get"?

HANGAR FLYING is a ritual pilots use to amuse themselves when nonflying weather keeps them hangar bound. It is well known that all pilots present at such sessions have their own opinions on any and all aviation subjects which arise. Since the reason for this unscheduled meeting is due to the existing weather conditions, the conversation will eventually drift to defining each pilot's belief as to the proper techniques to use in maneuvering an aircraft through the rougher weather conditions—successfully.

From past experience with hangar testimonials one can expect to hear such ideas as "good pilots use a circular scan pattern"; or "good pilots do not rely on their attitude indicator but rather use more reliable instruments such as the turn and slip indicator, airspeed indicator and the altimeter"; or "the good pilot is one who looks . . . ."

Hangar flying is invaluable in passing on lessons taught by years of experience, but some beliefs of these so-called "experts" are only myths. For example, the U.S. Army Aeromedical Research Laboratory (USAARL) at Ft. Rucker, AL, has found that what pilots see and where they look to fly their aircraft "ain't necessarily" what they believe they see or where they believe they are looking. Pilots' opinions as to where they visually concentrate while flying are often formulated by their peers, instructors, and training.

Opinion and training are not necessarily followed when pilots fly. One's eyes subconsciously travel to monitor proper flight gauges to maintain flight. Pilots' true visual workload

Ronald R. Simmons
Research Psychologist
U.S. Army [illegible]omedical Research Laboratory
[illegible]ort Rucker, AL

FIGURE 1: Two Views of An Aviator Wearing NAC Mask

FIGURE 2: Sample of Film Data

for the mission being flown, the type of aircraft or even the currency of the pilots can be determined through accurate, objective measurements rather than asking the pilots to tell an observer what they require to fly the aircraft.

For the last 5 years USAARL has been developing an extensive data base of the visual requirements associated with the UH-1 Huey utility helicopter in an attempt to delineate between subjective opinion and the actual visual requirements. This data base includes the visual performance during visual flight rules (VFR) day, instrument flight rules (IFR) night and nap-of-the-earth maneuvers, as well as some emergency procedures such as autorotations and autorotations with turns. In addition, for comparison the laboratory has collected similar data in the U-21 Ute fixed wing aircraft, the UH-1 flight simulator, and the OH-58 Kiowa scout helicopter. Future investigations will be completed in the Army's attack helicopter. The laboratory will have comparative visual performance-workload data across all aspects of Army Aviation with the completion of this data base.

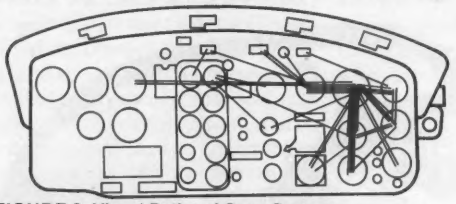


FIGURE 3: Visual Paths of Scan Pattern

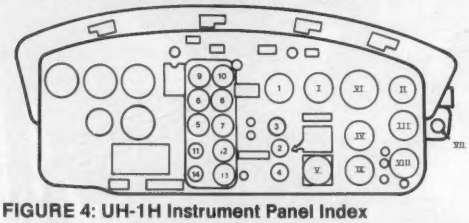


FIGURE 4: UH-1H Instrument Panel Index

ENGINE PERFORMANCE
1. Engine RPM
2. Gas Producer
3. Torque
4. Exhaust Termperature

OIL STATUS
5. Trans Oil Pressure
6. Engine Oil Pressure
7. Trans Oil Temperature
8. Engine Oil Temperature

FUEL STATUS
9. Fuel Pressure
10. Fuel Quantity

ELECTRICAL SYSTEM STATUS
11. Main Generator
12. DC Voltmeter
13. AC Voltmeter
14. Standby Generator

FLIGHT DISPLAYS
I. Airspeed Indicator
II. Altimeter
III. VSI
IV. RMI
V. Turn & Bank
VI. Artificial Horizon
VII. Magnetic Compass
VIII. Clock
IX. VOR

A mask device (figure 1) placed on the pilot's face was the method used in collecting visual performance data. A 60-degree field-of-view lens attached to the mask was used to photograph the subject's field-of-view. Also attached to the mask was a miniature lamp which projected a small beam of light on the subject's right eye. This beam was reflected off the cornea of the eye through a system of mirrors and prisms and was superimposed on a scene which was photographed through the main lens. The system is calibrated so that the reflected beam of light projects the exact point in the pilot's viewing field as to where the pilot was looking. Figure 2 shows a sample of the resulting film data. The light wedge in the scene is the location on which the eyes are concentrating.

A collection of visual performance data during instrument flight was made in a standard UH-1. The windows were covered to prevent the subject pilots seeing outside the aircraft. The maneuvers flown included standard instrument flight maneuvers such as instrument descending turns and an instrument landing system (ILS) approach into Cairns Army Airfield.

The 10 subjects selected for the experiment were comprised of two groups of pilots. The group a subject pilot belonged to was determined by the total number of flight hours flown. After the research flight was completed the subject pilots completed a questionnaire which would reflect their opinion as to the instruments which were required for each segment of the flight. The total time of the flight was 30 minutes.

The data collected was on 8,000 feet of motion picture film. This film finally demonstrated accurately where pilots *actually* looked for required visual information necessary to fly, and the path their eyes travel from one area to the next. The results and statistical analyses used were reported in USAARL Report No. 78-6. However, the summary of the results is discussed below to provide the aviation community (pilots and planners) some insight into visual activity required during instrument flights in the UH-1.

Listing the flight displays in order of importance for instrument flight, the pilots listed airspeed as the most important instrument followed by altimeter, vertical speed indicator, radio magnetic indicator (RMI) and the artificial horizon. This subjective rating indicated that the artificial horizon was the fifth most important instrument in the flight display. However, when these same pilots flew the IFR flight maneuvers and their visual activity was recorded, the artificial horizon was monitored on the average of 36 percent to 40 percent of all the available time during each

maneuver. The RMI required 21 to 25 percent of the remaining available time while the airspeed indicator, altimeter and vertical speed indicators never were used more than 11 percent each. Of course, only 2 to 5 percent of the pilots' time was left available to monitor the aircraft status gauges.

Other interesting information gained was the time required by the pilots to read and interpret the flight displays. The one and two pointer systems such as the airspeed indicator, altimeter and vertical speed indicator required about 400 milliseconds (.40 seconds) to interpret while the attitude indicator and radio magnetic indicator required about 600 milliseconds (.60 seconds).

Finally, the recorded eye movement provided some insight as to the "normal" scan pattern used during instrument flight. In the past pilots have been taught that their eyes scan the instruments in a circular pattern. Our data show this scan pattern does not exist since the attitude indicator and radio magnetic indicator comprised more than 60 percent of all visual activity. These instruments were used as the base of visual information from which the pilots would dart to other instruments to gain additional information and then return back to the visual base. Figure 3 demonstrates these visual paths.

Figure 4 is an index for the identification of the instruments on the UH-1 panel. The remaining figures are actual data plots of aviators' visual performances while scanning the UH-1H standard instrument panel. The first number in each instrument represents the percentage of time the particular instrument was visually scanned. The lower number represents the average time pilots remained looking at the instrument to read and interpret the information.

To help illustrate the visual activity during the IFR maneuvers, figure 5 is the mean visual activity of six currently proficient pilots during the instrument takeoff (ITO). Figure 6 represents the same data during inflight maneuvers such as cruise flight and figure 7 represents the ILS approach back to Cairns Army Airfield.

Those instruments which provided the pilots' basic stability information (pitch, roll and yaw information) were the most used instruments. However, during the ITO the turn and slip indicator rarely was used. Where could the pilots find other yaw information during this most unstable maneuver? The most obvious answer must be from the RMI. It would appear that pilots were unwilling to visually travel the distance required to gain the information from the turn and slip indicator.

What was the major difference between the two subject groups? The most currently proficient group was recently graduated pilots from the basic flight course at the U.S. Army Aviation Center at Ft. Rucker. The less proficient were instrument instructors from the school teaching instruments but lacking the same recent concentrated hands-on flight experience of the first group.

The major difference between the two groups of pilots (proficient versus less proficient) in the study was that the less proficient group required more visual time to maintain basic aircraft stability and therefore had less available time for the remaining instruments. During a critical period of flight such as inadvertent IFR recovery, this added workload could be catastrophic.

This article provides the aviation community with a knowledge of some of the workload activity of vision, one of our major information input sources. One only needs to attempt to fly with the eyes closed to appreciate the tremendous requirement placed on this one sense. Additionally, past data have shown that the pilot does not consciously direct the eyes' movement to gain information. Therefore, attempts to verbalize what the eye sees are impossible.

Perhaps with a better understanding of the capability and load placed on this input channel, pilots as well as planners can appreciate the need for better methods of presenting required information, training future pilots to better manage their visual activity, and planning tactical operations so as not to exceed the pilots' visual input capability.

After all—what you see is what you get.

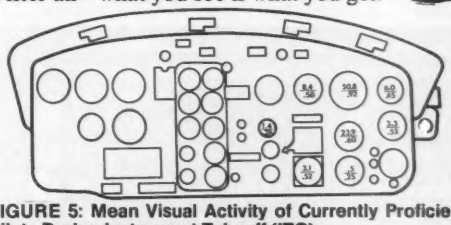


FIGURE 5: Mean Visual Activity of Currently Proficient Pilots During Instrument Takeoff (ITO)

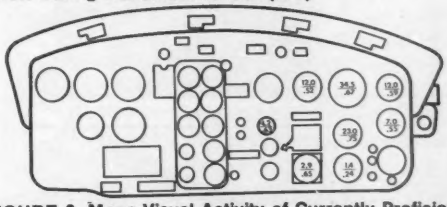


FIGURE 6: Mean Visual Activity of Currently Proficient Pilots

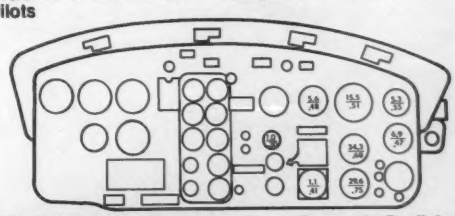
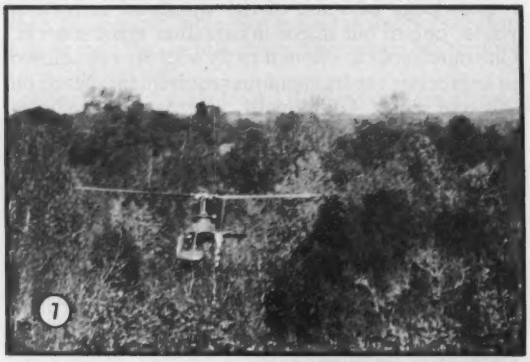


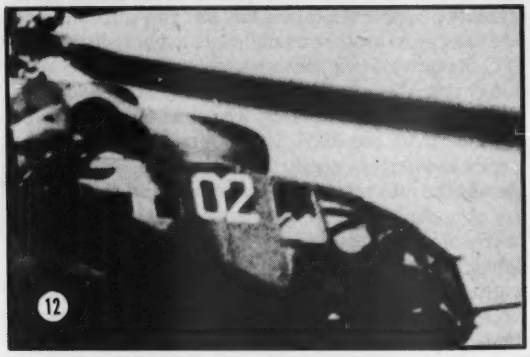
FIGURE 7: Mean Visual Activity of Currently Proficient Pilots During the ILS Approach

RECOGNITION QUIZ

This is the July Recognition Quiz which is part of a monthly series in which we will be showing you portions of aircraft, or other equipment, normally found on the battlefield. We will give you the answers and show you a fuller view of the same photo in the next issue. June's answers are on the facing page.

THIS MONTH'S HINT: This quiz is *tough* so you'll need a good hint. Only one of the aircraft below is in the *current U.S. Army inventory.*





Remember, June's hint was history in observation of Army Aviation's 38th Birthday on 6 June. Here's the June answers:

1. U-6 (L-20) Beaver (see page 46 of June 1980 issue).
2. U-1 Otter; dependable, but oh, so slow.
3. Whirlwind (Great Britain); the RAF's standard rescue helicopter in the 1950s.
4. UH-19 Chickasaw, the first U.S. Army troop/cargo carrying helicopter in combat (1952 in Korea).
5. Mi-4 HOUND (Soviet), troop/cargo carrying helicopter used in the 1950s, flown extensively in the Arctic and Antarctic.
6. CH-34 Choctaw, durable follow-on to the UH-19; carried the load until the UH-1 Huey appeared in the 1960s.

Reporting Final

Late News From Army Aviation Activities

FROM FORT RUCKER

TADS/PNVS for the AH-64. An Army contract for $45.8 million has been awarded to Martin Marietta Aerospace, Orlando, FL, for further development of the TADS/PNVS fire control and sensor system for the Army's AH-64 advanced attack helicopter (AAH) (see front cover).

The 26-month contract covers final development phase efforts and includes options for initial production quantities, a limited reliability assurance warranty program and technical data package. Production is scheduled to begin in December 1981.

Designed specifically for antiarmor mission in day, night and adverse weather conditions, the AAH can fight, survive and live with troops in the front line battlefield environment.

TADS/PNVS comprises two independently functioning subsystems—target acquisition and designation sight (TADS) to significantly enhance the battle effectiveness of the AAH, and pilot night vision sensor (PNVS) to allow the pilot to navigate at night. It provides the helicopter crew with advanced electro-optical hardware to accurately search out, recognize and engage enemy targets at standoff ranges during conditions previously considered unworkable.

A turret-mounted electro-optical system, TADS extends the range and accuracy at which the copilot-gunner can acquire, recognize and engage ground targets. It incorporates a variety of sensors—high-resolution TV, direct-view telescope and forward looking infrared radar (FLIR)—for day/night target acquisition. Although the FLIR is the primary sensor for night acquisition, it also augments the day sensors.

TADS also has a laser rangefinder/designator which provides several key functions: target designation for delivery of HELLFIRE either autonomously or by other aircraft, designation for Copperhead or other laser-guided munitions, target ranging for AAH guns or rockets, and accurate updating of the AAH doppler navigation system.

The PNVS is a turret-mounted wide field-of-view FLIR system that allows the pilot to navigate nap-of-the-earth at night and at other periods of reduced visibility. FLIR imagery is observed by the pilot on a helmet-mounted display which couples PNVS turret movements to the movement of the helmet through the use of electro-optical sensors. **(AD)**

Another First. Second Lieutenant Patricia Fleming of the United States Army Reserve 190th Aviation Company, Olathe, KS, is now a rated CH-47 Chinook helicopter pilot. She is the first woman to complete that 7-week course at Ft. Rucker, having entered it when she was graduated from the initial entry flight program in April.

There were some problems, she admitted, in transitioning to the CH-47 which weighed about 37,000 pounds more than the UH-1 Huey she had been flying. "But I didn't feel too badly about that because my stick buddy in the Chinook had logged more than 5,000 hours compared to my 178—and for the first few hours in the cockpit we were both having the same difficulties in learning to handle the aircraft."

The 190th has 23 of the cargo helicopters assigned to it, so LT Fleming expects plenty of opportunities to use her newly acquired skill.

Brigade Command Change. Colonel David J. Allen assumed command of the 1st Aviation Brigade at Ft. Rucker in a change of command ceremony 16 May on the Army Aviation Center Parade field.

Colonel Allen accepted the unit flag from Major General James H. Merryman, commanding general of Ft. Rucker, who had accepted it from Colonel (P) John C. Bahnsen Jr., the outgoing commander. On 10 June COL Bahnsen was promoted to brigadier general and Assistant Division Commander, 2d Armored Division, Ft. Hood, TX.

(USAAVNC-PAO)

FROM WASHINGTON

Service Medal's Approved. Those who directly participated in disaster relief operations in the following locations during the period indicated are eligible for award of the Humanitarian Service Medal:

- Sri Lanka: 27 November 1978 to 31 December 1978.
- Nicaragua: 17 December 1979 to 10 March 1980.
- Azores: 1 January 1980 to 15 January 1980.

Further information may be obtained by contacting the Personnel Actions Section, Adjutant General Division, AV-221-5215/3318. **(MILPERCEN)**

FROM TRADOC

Promotion Points For Army Correspondence Courses. Soldiers, E1 through E5, can now earn promotion points for completing Army correspondence courses—even in their primary MOS. One

promotion point is earned for every five credit hours completed.

The wide variety of courses has been developed by 20 Department of Defense and TRADOC schools. All courses are offered through the Army Institute for Professional Development located at Ft. Eustis, VA.

Soldiers may take the courses individually or in groups. The supervised on-the-job training program also is available to squads or teams. Anyone interested should check out the courses listed in the Army Correspondence Course Catalogues (DA Pam 351-20) at the education center. A DA Form 145 enrollment application must be completed and mailed to: The Army Institute for Professional Development, U.S. Army Training Support Center, Newport News, VA 23628. Further information is available by calling AUTOVON 927-3085, or writing the above address. **(CIB-TRADOC)**

FROM PHILADELPHIA

Technical Meeting Scheduled. The American Helicopter Society is sponsoring a major technical meeting in Philadelphia in October 1980. The Technical Program will break out into five sessions: Rotor System Design Concepts; Rotor Blade Design; Rotor Hub/Controls Design; Rotor Systems Optimization; and Design for Operating Environment.

For more information contact: Leonard J. Marchinski, Boeing Vertol Company, P.O. Box 16858; M/S P32-38, Philadelphia, PA 19142; Telephone: (215) 522-7163.

FROM TEXAS

XV-15 Hits 302 MPH Mark. Bell Helicopter Textron's XV-15 tilt rotor research aircraft has moved up to a true airspeed of 302 miles per hour in the airplane mode at an altitude of 8,300 feet. This speed was attained 21 April in aircraft no. 2 at Bell's Flight Research Center in Arlington, TX. During the envelope expansion portion of its flight test program, the XV-15 is expected to reach an altitude of 18,000 feet and attain a speed of 340 miles per hour at maximum level flight airspeed. The aircraft is scheduled to be delivered to NASA's Dryden Flight Research Center at Edwards Air Force Base, CA this summer. Bell is working under a joint contract with NASA and the U.S. Army Research and Technology Laboratories in the design, manufacturing and testing of the XV-15. **(BHT)**

FROM EUROPE

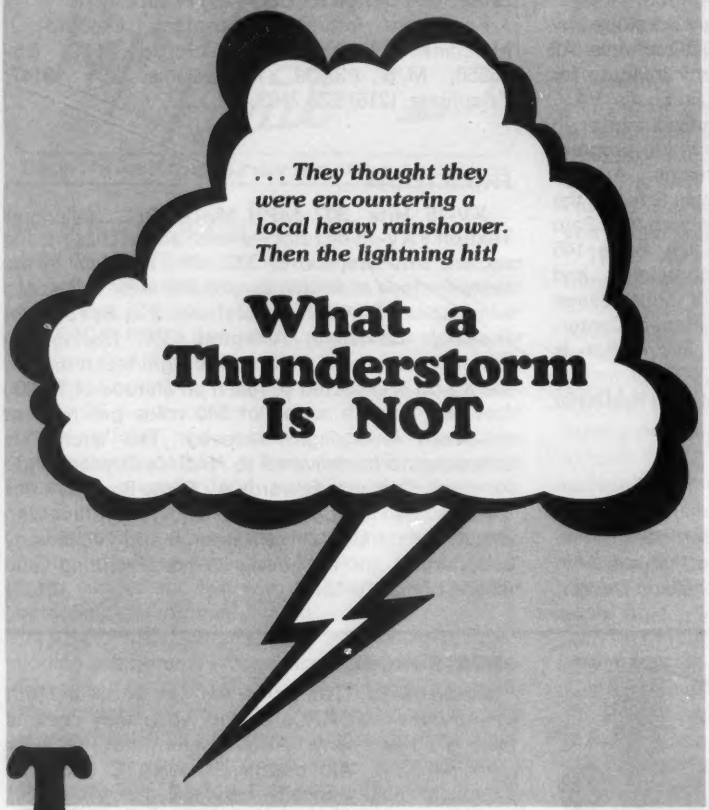
Albatros IV. Troops of the 1st Battalion 16th Infantry left their APCs behind when they became one of the many Allied units that recently participated in "Albatros IV," the NATO airmobile maneuver held annually between the VII (U.S.) Corps and the II (GE) Korps.

The exercise provided an opportunity to develop joint Army Aviation interoperability training and to establish joint air transportability procedures for use in wartime. (SP4 John Arpin) **(PAO-USMCA)**

Members of HHC 1st Battalion 16th Infantry (left) disembark during a refueling stop at Schwabisch Hall Army Airfield.

Two German CH-53 helicopters (below) from the Heeresflieger Kommando II on route to initial Bavarian LZ. Photos By SP4 John Arpin

Adapted from an article by Major Garry S. Mueller, USAF, that appeared in *Aerospace Safety* and *Flightfax*



THE WEATHER phenomenon known as a thunderstorm has been the subject of an infinite number of articles in almost as many magazines. There are two accidents which prompt this discussion of *what a thunderstorm is not.*

The first accident was unfortunately fatal to the crew. After entering an area of heavy precipitation, they encountered turbulence, lightning and all the other adverse characteristics associated with thunderstorms. Before they could fly through the heavy rain, the aircraft was hit by lightning. The strike ignited a residual fuel-air mixture in a wing tank and caused a low order explosion strong enough to cause catastrophic failure of the left wing. The aircraft went out of control and crashed. This accident had all the weather factors of what we know as a thunderstorm.

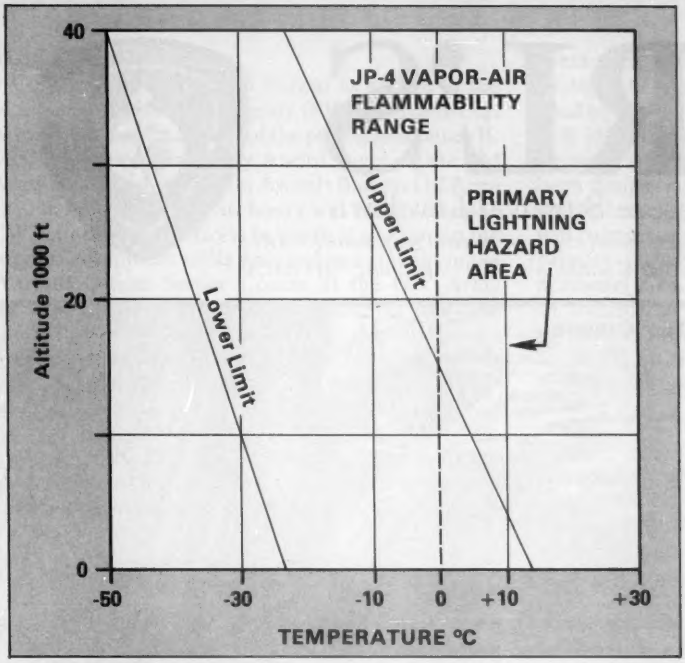
The second, more recent, accident was also caused by lightning. *It is the accident which resulted from what a thunderstorm is not.* The scenario is almost identical to the other mishap. Again, the flight was being conducted in an area of heavy precipitation. Here is where the similarities temporarily end. There was no turbulence, heavy hail, etc., commonly associated with thunderbumpers. Since the aircrew had not received any weather advisories warning them of thunderstorms, *they thought they were encountering a local heavy rainshower.* They also were hit by lightning, causing a wing fuel-air mixture explosion and catastrophic failure of a significant portion of the left wing. Thanks to the aircrew's superior handling of this emergency, the aircraft was safely landed. This accident was caused by what a thunderstorm is not.

A thunderstorm is not always the big black cloud with an anvil top, turbulence, heavy hail, etc., that comes to mind when a weather forecaster mentions that one word. Thunderstorms have different characteristics and often vary, depending on the geographical location, time of year and many other factors. The absence of typical thunderstorm phenomena does not mean no thunderstorm—it may be what a thunderstorm is not.

Current Air Weather Service policy requires weather forecasters to use the term "thunderstorm" when referring to any cumulonimbus cloud. Weather briefs which predict, *and I emphasize predict,* thunderstorms are often overly pessimistic because cell buildups and exact locations are tough to forecast. As we all know, the buildups often do not even happen. The key point is that the prediction is advisory in nature and should not be ignored!

A recent study revealed that 80 percent of reported lightning strikes occurred when aircraft were in clouds, with rain, some turbulence, and an outside air temperature within 8 degrees C. of the freezing temperature. The remaining 20 percent is the category the last accident fits into because of what a thunderstorm is not. Lightning is basically an atmospheric electrical discharge process which often travels for several miles. The electrical current can be as much as 200,000 amps, but is normally in the range of 20,000 to 30,000 amps.

Clouds become charged by vertical movement of water droplets and ice crystals within the clouds. This movement causes either a positive or negative charge center to develop. The primary negative charge center will be near the -5 degree C. level; the main positive charge will be near the -20 degree



C. level. A secondary positive charge is also centered near the 0 degree C. level. Simply stated, the intense negative charge is at the cloud base and the primary positive charge is somewhere in the upper half of the cloud. The intense negative charge in the area of heaviest precipitation is so strong that it also induces a positive charge in the normally negatively charged earth's surface.

The region of heaviest rain is normally near the negative charge or cloud base.

Extremely high electric potentials (voltages) result from the charge distributions. When the voltages reach a critical value, the atmosphere begins to ionize between the charge centers. (In dry air, the critical value is 300,000 volts for each meter between the charge centers.) The resultant electrical discharge from the negative center towards the positive center travels by a path of least resistance. As this streamer approaches within 10 to 50 meters of the positive charge, a positive streamer reaches out to meet it, creating an ionized path between the two unlike centers. The positive charge moves supersonically along the ionized channel, creating the successive flashes and bangs we know as lightning.

It has not been determined whether or not an aircraft will trigger a lightning discharge. How they become involved also has several theories. The metal skin of an aircraft is more conductive than the atmosphere. As the initial negative charge travels the path of least resistance, it may go through the aircraft and continue into the atmosphere.

It is also possible that an aircraft may generate positive streamers which link to the negative one. The charge then follows through the aircraft and continues into the atmosphere. Either way, the aircraft actually becomes a link in the electrical circuit. There is always a point of entry and exit from the airframe.

As shown on the chart, JP4 is within its flammability range most of the time the aircraft is in the temperature and altitude regime conducive to a lightning strike. Lightning can ignite fuel vapor by burning through the tank skin and arcing into a tank. It can also explode a tank by inducing overvoltages in fuel level probes or heating the skin of the aircraft to a point temperature above the fuel's flash point.

Lightning can cause other hazardous airborne emergencies. Popped circuit breakers, blown fuses, burned wiring or total electrical failure can result if the electrical system is hit. Effects to the aircrew can be mild shocks to temporary blindness.

Heavy precipitation is the process which creates the charge distribution required for lightning. Aircrews can reduce the probability of a lightning strike by avoiding the prime strike temperature and altitude regimes. Cumulonimbus clouds, regardless of typical visible attributes, are thunderstorms and should be treated as *a thunderstorm which is not.*

Available Training Film(s)

Order by title and number from: Commander, Training Support Center, Training Materiel Support Detachment, ATTN: ATTSC-ET-TM, Tobyhanna, PA 18466:

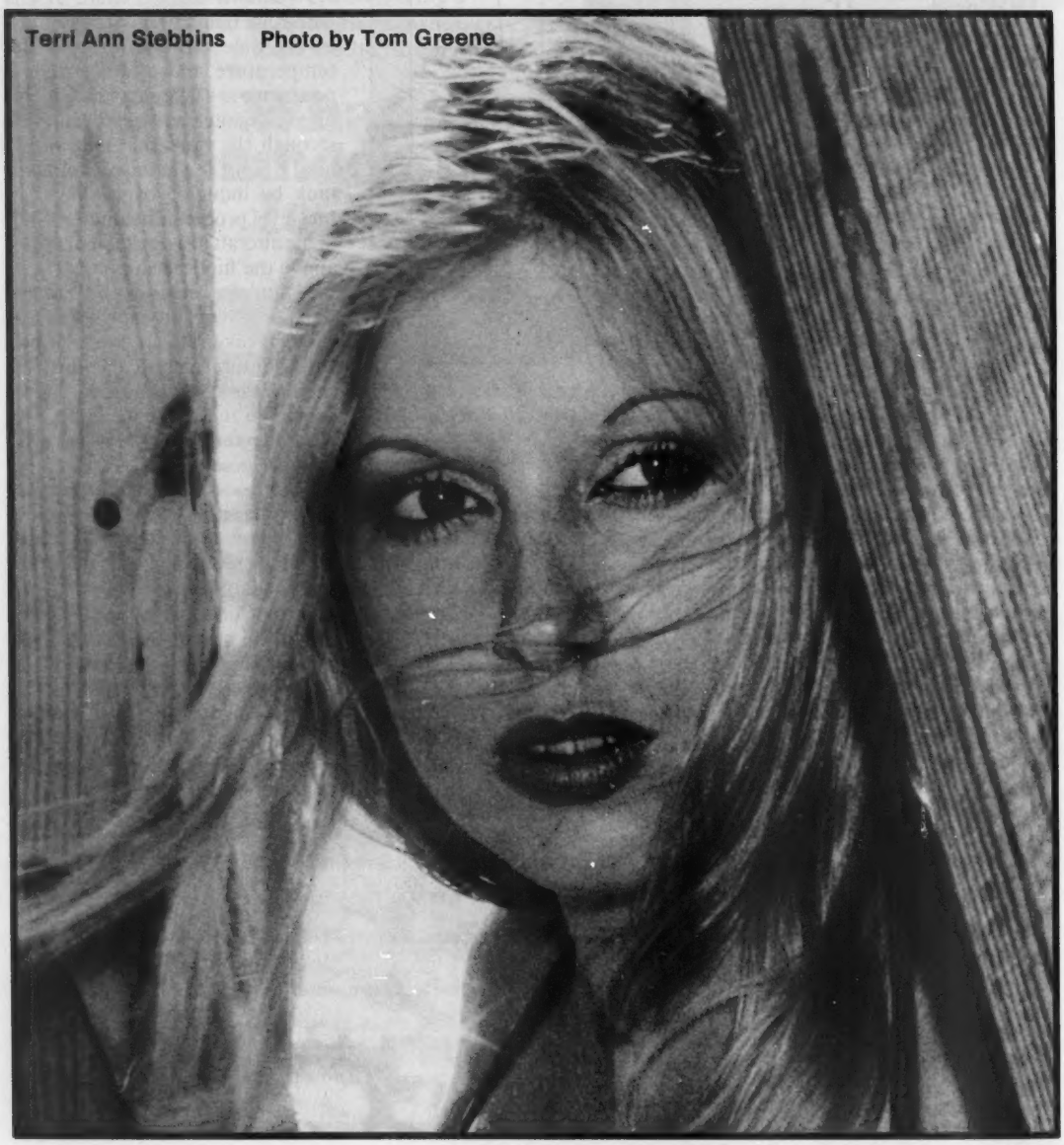
Just Before the Thunder, TF 46-6118. (Color, 14 minutes, 1979) Recreates an actual aircraft accident depicting how poor judgment, poor planning and improper action leads to disaster.

Know Your Clouds, TF 46-3724. (Color, 16 minutes, 1967) Development of the 10 basic types of clouds, their principal characteristics, their relative positions and average altitudes and their flight hazards.

PEARL'S

Personal Equipment & Rescue/Survival Lowdown

If you have a question about personal equipment or rescue/survival gear, write PEARL, DARCOM, ATTN: DRCPO-ALSE, 4300 Goodfellow Blvd., St. Louis, MO 63120



Terri Ann Stebbins **Photo by Tom Greene**

ALSE Expert Honored

Congratulations to CW3 Harold D. Hintze of the 146th ASA Aviation Company (FWD), Eighth U.S. Army, this year's recipient of the prestigious James H. McClellan Aviation Safety Award, given at the 22d Army Aviation Association Awards Banquet 12 April 1980 in Atlanta, GA. This honor was bestowed upon CW3 Hintze for his efforts in the field of aviation life support equipment while assigned as a student in the Warrant Officer Senior Course at the U.S. Army Aviation Center, Ft. Rucker, AL. During this time CW3 Hintze originated, inspired and personally led a research effort which culminated in a 742-page training package adopted by Department of the Army as Training Circular 1-62, "Aviation Life Support Equipment." This publication—the first of its kind—is being distributed to the field and will enable Army Aviation units around the world to establish and, more importantly, to maintain a standard viable ALSE program.

New Inspection Intervals

The inspection intervals for survival kits/components and survival vests/components have been changed. Survival Kits, Individual, Hot Climate (NSN 1680-00-973-1861), Cold Climate (NSN 1680-00-973-1862) and Overwater (NSN 1680-00-973-1863) will be inspected prior to initial issue, every 120 days, and prior to and after repair/modification. The 120-day interval for the overwater survival kit will run concurrent with the 120-day life raft inspection.

Survival Kits, Seat, OV-1, Hot Climate (NSN 1680-00-148-9234), Cold Climate (NSN 1680-00-148-9233) and Overwater (NSN 1680-00-140-3540) will be inspected prior to installation, concurrently with the ejection seat inspection and prior to and after repair/modification.

Survival Vests, Individual, OV-1 (Large, NSN 1680-00-205-0474; Small, NSN 1680-00-187-5716) and SRU-21/P (NSN 8465-00-177-4819) will be inspected every 30 days. Life preserver portions of the OV-1 vests will continue to be inspected every 120 days in accordance with TM 5-4220-202-14.

These new inspection intervals are effective immediately and will be incorporated in the forthcoming revision to TM 55-1680-317-23&P. Point of contact on this matter is Mr. D. B. Hopkins, TSARCOM, AUTOVON 693-3715.

ALSE MOS Status

Well, we've got some good news and we've got some bad news. First, the bad news. The military occupational specialty (MOS) package went all the way through channels to Military Personnel Center where the determination was made not to support an ALSE MOS career field at this time due to force constraints within the Army. So, for a while at least, we will not have an ALSE MOS. And now for the good news. As an interim measure, an ALSE additional skill identifier (ASI) has been approved. The U.S. Army Transportation School at Ft. Eustis, VA has been designated as the proponent for ALSE training and is currently developing a 4-week course which will culminate in the awarding of the ALSE ASI. The primary purpose of this course will be to qualify personnel in ALSE maintenance, repair and inspection. In addition it will identify qualified personnel and provide necessary support data to be used to justify an ALSE MOS career field. The target date for the first formal course is first quarter fiscal year (FY) 1981.

System Assessment

Aviation life support equipment is the subject of a system assessment being conducted by this office and other key elements within TSARCOM. Survey questionnaires have been mailed to FORSCOM, WESTCOM, Eighth U.S. Army, U.S. Army Europe, the U.S. Army Reserve and the Army National Guard for further dissemination to aviation units. In addition field visits are being conducted at Ft. Hood, TX; Ft. Rucker, AL; Ft. Campbell, KY; Ft. Bragg, NC; Wright Patterson AFB, OH; and Scott AFB, IL. Besides the overall ALSE system selected items of equipment also are being assessed; these include the AN/PRC-90 survival radio, survival vest, life preserver, aircraft seat belts and individual survival kits (hot climate, cold climate and overwater). The overall objective of this assessment is to identify and take/recommend corrective actions on problems with ALSE which are degrading user satisfaction, operational readiness and life cycle costs. The target date for the completion of this effort is 30 September 1980.

AMDF Update

This office is conducting a complete review and update of the Army Master Data File (AMDF) with reference to aviation life support equipment. This project entails compiling a complete list of all items of ALSE used by the Army, to include Air Force and Navy items, and then screening the AMDF to ensure that all these items are listed. We are soliciting information from personnel in the field to ensure that all items of ALSE (end items, repair parts and test equipment) are currently listed in the AMDF in order to help alleviate requisitioning problems. Anyone having knowledge of ALSE items which are not now, but should be, included in the AMDF are requested to furnish that information to this office either in writing or telephonically. Action officer is Mr. John Chubway, AUTOVON 693-3307/3721.

AN/PRC-90 Shortage

As everyone must be aware of, there is a shortage of AN/PRC-90 survival radios Armywide. This office has been advised by CERCOM, who manages the item, that the PRC-90 is no longer in production and that there are about 4,000 on backorder. The new replacement AN/PRC-112 is not scheduled for production until FY 1983. Since the situation of having no radio available between now and FY 1983 is both unrealistic and untenable, we have recommended the procurement of more PRC-90 radios until such time as the PRC-112 becomes available. For the moment, however, it appears that everyone will have to do with what they have until the problem can be rectified. POC at this office for further information is Mr. Ed Daughety, AUTOVON 693-3307/3721.

Proper Wear Of The GS/FRP-2

Do you know the proper way to wear your GS/FRP-2? Do you know what your GS/FRP-2 is? In case you aren't aware of it, that is the correct designation for your Nomex flight gloves. Apparently a recent article in FLIGHTFAX (Vol 8, No 20, 5 Mar 1980) regarding the proper wearing of the gloves, i.e., inside the flight suit sleeve, has sparked quite a controversy, since most aviators have been taught to wear the gloves on the outside of the sleeve. To resolve the question we queried the U.S. Army Aeromedical Research Laboratory (USAARL) at Ft. Rucker, and they informed us that there is, in fact, no standard policy for the wearing of Nomex gloves. The important thing is that there is a "fire tight" seal between the sleeves of the Nomex flight suit and the gloves. This can be achieved by placing the gloves under the sleeves or over the sleeves with equal results. No other specified policy has been established. USAARL also noted, however, that gloves that are too large or are old may be extremely loose about the cuff, thus contributing to a potential hazard of accidently tripping switches in the aircraft. So in cases like that common sense would dictate that the gloves be worn inside the flight suit sleeve; otherwise, it's up to the aviator, as long as the fire seal is maintained.

Questions And Answers

Is the boot, NSN series 8430-00-135-2672, mentioned in the October 1979 PEARL the Wellington-style boot? Is it available to Army aircrewmembers? (SSG Carl Gordon, Davison AAF, Ft. Belvoir, VA)

The PEARL article you are referring to is unfortunately in error. The boot alluded to in that article is actually a climber's boot and not at all suitable for aircrew personnel. Since we have had several inquiries about a Wellington-style boot, we decided it was best to contact the footwear experts at NARADCOM for the straight dope. They informed us that there is no Wellington-style boot in the Army system, not even for combat vehicle crewmembers (a rumor), and that only the lace-up type combat boot is available. To pursue the matter even further we followed up another rumor that the Navy had a Wellington boot for its aircrew personnel, but this also turned out to be untrue. Apparently, the few people who have been observed wearing these handsome looking boots purchased them out of their own pocket, and we can assure you that this is the only way they can be obtained.

When enlisted aviation personnel ETS or transfer out of our unit, they are required to turn in their flight helmets, which are then to be refurbished and reissued to new personnel. What is the proper way to clean and sanitize the SPH-4 prior to reissue? (MSG Clifford Roffe, HHC 13th COSCOM, Ft. Hood, TX)

The correct procedure, according to USAARL personnel, is to wash the entire helmet thoroughly with warm water and mild soap, to include the liner. At the same time, the earcup pads, earcup retainer assembly and complete headband-suspension assembly should be replaced. The earphones and microphone should be wiped down with isopropyl alcohol (disposable alcohol preps are excellent for this). After this thorough cleaning and the installation of new earcup pads, retainer assembly and headband assembly, the SPH-4 is ready for reissue. (Thanks to SSG Gerald Johnson, USAARL, Ft. Rucker, AL for this info.)

Some of our units here in Europe have been receiving some shelf-life items such as the batteries for the PRC-90 and SDU-5/E, either with only partial time remaining on them or totally expired. What criteria can we use (i.e., how much remaining time) to determine if we should accept shelf-life items with only partial time remaining on them? (CW3 Dave Klindt, U.S. Army Safety and Standardization Board, USAREUR)

This is a problem which seems to be recurring all too frequently. We contacted the ALSE office within the directorate for maintenance at TSARCOM, and the following information was provided: If items are received with time still remaining on them, no matter how limited, they should be accepted and used until expired; however, if you do have such a problem, you should contact the item manager of the particular item in question to see if the problem can be resolved. As for receiving expired items, the same thing basically holds true. There are no general provisions for extending the shelf life on items once they have expired, and consequently they should no longer be used; however, the individual item manager should be consulted to determine if shelf life may be extended. (POC for further information is Mr. Merkel Bailey, TSARCOM, AUTOVON 693-3715.)

U.S. ARMY AVIATION STANDARDIZATION

Directorate of Evaluation/Standardization

REPORT TO THE FIELD

DES welcomes your inquiries and requests to focus attention on an area of major importance. Write to us at: Commander, U.S. Army Aviation Center, ATTN: ATZQ-ES, Ft. Rucker, AL 36362, or call us at AUTOVON 558-3504 or commercial 205-255-3504. After duty hours call Fort Rucker Hot Line, AUTOVON 558-6487 or commercial 205-255-6487 and leave a message.

Complying With AR 95-16

Army Regulation 95-16, "Weight and Balance/Army Aircraft," dated 1 April 1979, effective 15 May 1979, has significantly increased the weight and balance requirements for Army aircraft and aviators. The regulation requires that typical aircraft loading arrangements indicated on DD Form 365F must be maintained in an aircraft weight and balance file in flight operations and in the aircraft logbook. The typical aircraft loading arrangements depend on the type aviation unit and unit mission and should be specified by the commander. Once the typical loading arrangements have been defined, the implementation burden falls upon the weight and balance technician. Depending on the size of the unit and the number of aircraft, this burden can sometimes assume monumental proportions.

DES personnel have observed numerous Active and Reserve Component units during implementation of the new regulation. The preferred method observed to date standardizes forms between like aircraft, reduces clerical errors and reduces the workload on the weight and balance technician. For the purpose of this article we will discuss the OH-58A Kiowa aircraft using the transport side of the DD Form 365F. These principles and methods can be applied to all Army aircraft. An example follows:

STEP #1. **First, the commander must specify the typical loading arrangements. This is based on the type unit and the unit mission. For this article the commander has specified four typical loading arrangements:**

1. **Pilot only.**
2. **Pilot and copilot.**
3. **Pilot, copilot and one passenger.**
4. **Pilot, copilot and two passengers.**

STEP #2. **The weight and balance technician now prepares typical loading arrangement master forms, examples at right.**

Pilot only

STEP #3. **Reproduce the master forms in sufficient quantities for all unit aircraft and retain the master copies for future use.**

Pilot and copilot

(Item 17 and signature block same as above)

WEIGHT AND BALANCE CLEARANCE FORM F
TRANSPORT
(USE REVERSE FOR TACTICAL MISSIONS)

Cross References: AAF Form 3670; ROAF Form F 115 C; MIM 5-41 (HWI)

FOR USE IN: T.O. 1-1B-40; AR 95-1/B-40 & TM 55-405-9

DATE | AIRCRAFT TYPE: OH-58A | FROM | HOME STATION: HEY

MISSION/TRIP/FLIGHT/NO. | SERIAL NO. | TO | PILOT

LIMITATIONS	TAKEOFF	LANDING	LIMITING WING FUEL
* ALLOWABLE GROSS WEIGHT	3000	3000	
TOTAL AIRCRAFT WEIGHT (Ref. 11)			
OPERATING WEIGHT PLUS ESTIMATED LANDING FUEL WEIGHT			
OPERATING WEIGHT (Ref. 8)			
ALLOWABLE LOAD (Ref. 18) (Use SMALLEST figure)			
* PERMISSIBLE C. G. TAKEOFF	FROM	TO (% M.A.C. or IN.)	
* PERMISSIBLE C. G. LANDING	FROM	TO (% M.A.C. or IN.)	
* LANDING FUEL WEIGHT	132	12	

ITEM		WEIGHT	INDEX OR MOM/100
1	BASIC AIRCRAFT (From Chart C)		
2	OIL (1.5 Gal.)	13	2
3	CREW (No.) 1	200	13
4	CREW'S BAGGAGE		
5	STEWARD'S EQUIPMENT		
6	EMERGENCY EQUIPMENT		
7	EXTRA EQUIPMENT		
8	OPERATING WEIGHT		
9	TAKEOFF FUEL (66.5 Gal.)	432	49
10	WATER INJ. FLUID (Gal.)		
11	TOTAL AIRCRAFT WEIGHT		

DISTRIBUTION OF ALLOWABLE LOAD (PAYLOAD)

UPPER COMPARTMENTS: WEIGHT / MOM/100 / CU. FT. / PASSENGERS

LOWER COMPARTMENTS: COMPT. / PASSENGERS

REMARKS

16	TAKEOFF C. G. IN % M. A. C. OR IN.	
17	LESS FUEL	300 / 35
18	LESS AIR SUPPLY LOAD DROPPED	
19	MISC. VARIABLES	
20	ESTIMATED LANDING CONDITION	
21	ESTIMATED LANDING C. G. IN % M. A. C. OR IN.	

COMPUTED BY

TOTAL WEIGHT REMOVED	–	–
TOTAL WEIGHT ADDED	+	+

CW3 J. H. JONES SIGNATURE
WEIGHT AND BALANCE AUTHORITY

CW3 J. H. JONES SIGNATURE
PILOT

* ALLOWABLE GROSS WEIGHT			2	OIL (Gal.)	
TOTAL AIRCRAFT WEIGHT (Ref. 11)			3	CREW (No.) 2	200 / 26
OPERATING WEIGHT PLUS ESTIMATED LANDING FUEL WEIGHT			4	CREW'S BAGGAGE	
OPERATING WEIGHT (Ref. 8)			5	STEWARD'S EQUIPMENT	
ALLOWABLE LOAD (Ref. 18) (Use SMALLEST figure)			6	EMERGENCY EQUIPMENT	
* PERMISSIBLE C. G. TAKEOFF	FROM	TO (% M.A.C. or IN.)	7	EXTRA EQUIPMENT	
* PERMISSIBLE C. G. LANDING	FROM	TO (% M.A.C. or IN.)	8	OPERATING WEIGHT	
* LANDING FUEL WEIGHT	132	12	9	TAKEOFF FUEL (66.5 Gal.)	432 / 49
			10	WATER INJ. FLUID (Gal.)	
			11	TOTAL AIRCRAFT WEIGHT	

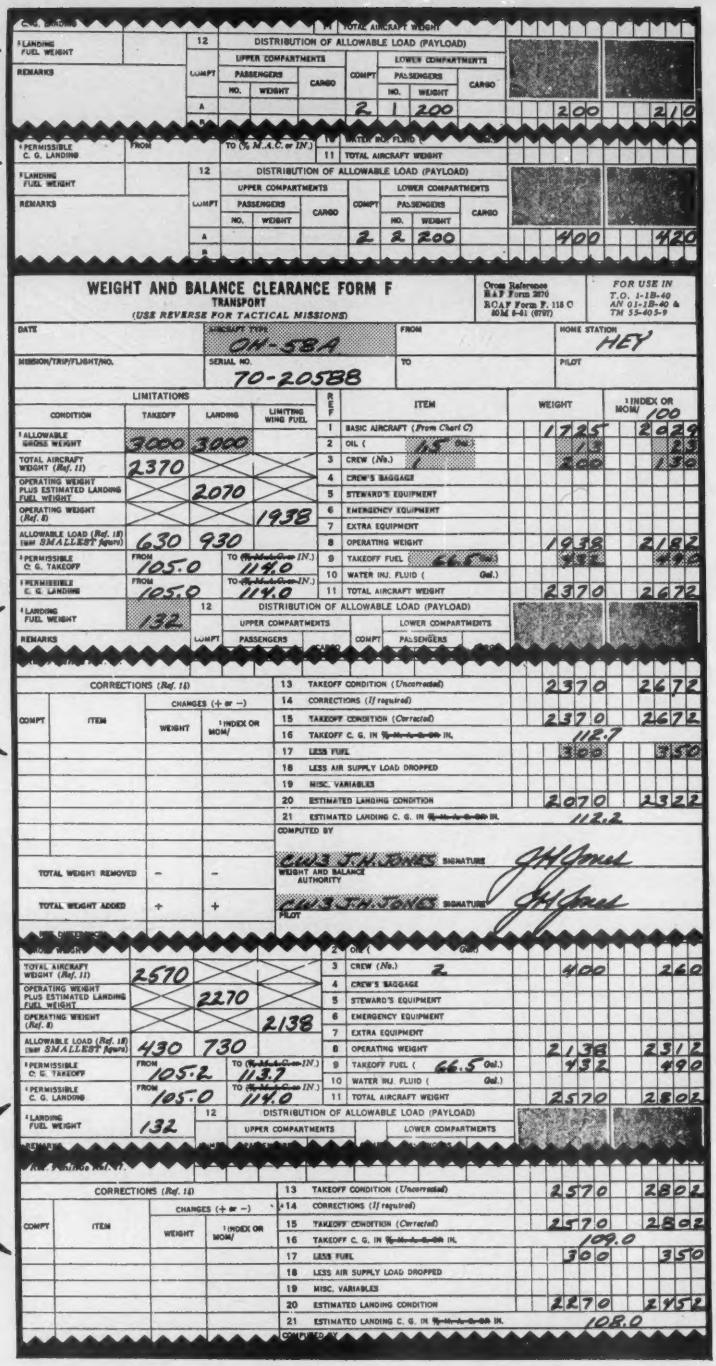
DISTRIBUTION OF ALLOWABLE LOAD (PAYLOAD)

UPPER COMPARTMENTS | LOWER COMPARTMENTS

REMARKS

Pilot, copilot and one passenger

Pilot, copilot and two passengers



WEIGHT AND BALANCE CLEARANCE FORM F
TRANSPORT
(USE REVERSE FOR TACTICAL MISSIONS)

Cross Reference
DA Form 2408
DA/AF Form F, 118 C
NGM 8-81 (07/07)

FOR USE IN
T.O. 1-1B-40
AN 01-1B-40 &
TM 55-405-9

DATE

AIRCRAFT TYPE: OH-58A

FROM

HOME STATION: HEY

MISSION/TRIP/FLIGHT/NO.

SERIAL NO.: 70-20588

TO

PILOT

LIMITATIONS

CONDITION	TAKEOFF	LANDING	LIMITING WING FUEL
‡ ALLOWABLE GROSS WEIGHT	3000	3000	
TOTAL AIRCRAFT WEIGHT (Ref. 11)	2370		
OPERATING WEIGHT PLUS ESTIMATED LANDING FUEL WEIGHT		2070	
OPERATING WEIGHT (Ref. 8)			1938
ALLOWABLE LOAD (Ref. 12) then SMALLEST figure)	630	930	
‡ PERMISSIBLE C. G. TAKEOFF	FROM 105.0	TO (Fwd. or Aft. IN.) 114.0	
‡ PERMISSIBLE C. G. LANDING	FROM 105.0	TO (Fwd. or Aft. IN.) 114.0	
‡ LANDING FUEL WEIGHT	132		

REF	ITEM	WEIGHT	‡ INDEX OR MOM/100
1	BASIC AIRCRAFT (From Chart C)	1725	2629
2	OIL (4.5 Qts.)	13	21
3	CREW (No.) 1	200	150
4	CREW'S BAGGAGE		
5	STEWARD'S EQUIPMENT		
6	EMERGENCY EQUIPMENT		
7	EXTRA EQUIPMENT		
8	OPERATING WEIGHT	1938	2182
9	TAKEOFF FUEL (66.5 Gal.)	432	490
10	WATER INJ. FLUID (Gal.)		
11	TOTAL AIRCRAFT WEIGHT	2370	2672

12 DISTRIBUTION OF ALLOWABLE LOAD (PAYLOAD)

COMPT	UPPER COMPARTMENTS PASSENGERS NO.	UPPER COMPARTMENTS PASSENGERS WEIGHT	UPPER COMPARTMENTS CARGO	LOWER COMPARTMENTS PASSENGERS NO.	LOWER COMPARTMENTS PASSENGERS WEIGHT	LOWER COMPARTMENTS CARGO
A				2	200	
B						

REMARKS

	200		210
	400		420

Pilot only

CORRECTIONS (Ref. 14)

COMPT	ITEM	CHANGES (+ or −) WEIGHT	CHANGES (+ or −) ‡ INDEX OR MOM/100
	TOTAL WEIGHT REMOVED	−	−
	TOTAL WEIGHT ADDED	+	+

13	TAKEOFF CONDITION (Uncorrected)	2370	2672
14	CORRECTIONS (If required)		
15	TAKEOFF CONDITION (Corrected)	2370	2672
16	TAKEOFF C. G. IN (Fwd. or Aft.) IN.	112.7	
17	LESS FUEL	300	350
18	LESS AIR SUPPLY LOAD DROPPED		
19	MISC. VARIABLES		
20	ESTIMATED LANDING CONDITION	2070	2322
21	ESTIMATED LANDING C. G. IN (Fwd. or Aft.) IN.	112.2	

COMPUTED BY

CW3 J.H. JONES SIGNATURE J.H. Jones
WEIGHT AND BALANCE AUTHORITY

CW3 J.H. JONES SIGNATURE J.H. Jones
PILOT

Pilot and copilot

TOTAL AIRCRAFT WEIGHT (Ref. 11)	2570		
OPERATING WEIGHT PLUS ESTIMATED LANDING FUEL WEIGHT		2270	
OPERATING WEIGHT (Ref. 8)			2138
ALLOWABLE LOAD (Ref. 12 then SMALLEST figure)	430	730	
‡ PERMISSIBLE C. G. TAKEOFF	FROM 105.2	TO (Fwd. or Aft.) 113.7 IN.	
‡ PERMISSIBLE C. G. LANDING	FROM 105.0	TO (Fwd. or Aft.) 114.0 IN.	
‡ LANDING FUEL WEIGHT	132		

3	CREW (No.) 2	400	260
4	CREW'S BAGGAGE		
5	STEWARD'S EQUIPMENT		
6	EMERGENCY EQUIPMENT		
7	EXTRA EQUIPMENT		
8	OPERATING WEIGHT	2138	2312
9	TAKEOFF FUEL (66.5 Gal.)	432	490
10	WATER INJ. FLUID (Gal.)		
11	TOTAL AIRCRAFT WEIGHT	2570	2802

12 DISTRIBUTION OF ALLOWABLE LOAD (PAYLOAD)

COMPT	UPPER COMPARTMENTS PASSENGERS NO.	UPPER COMPARTMENTS PASSENGERS WEIGHT	UPPER COMPARTMENTS CARGO	LOWER COMPARTMENTS PASSENGERS NO.	LOWER COMPARTMENTS PASSENGERS WEIGHT	LOWER COMPARTMENTS CARGO
A						
B						

REMARKS

CORRECTIONS (Ref. 14)

COMPT	ITEM	CHANGES (+ or −) WEIGHT	CHANGES (+ or −) ‡ INDEX OR MOM/100

13	TAKEOFF CONDITION (Uncorrected)	2570	2802
14	CORRECTIONS (If required)		
15	TAKEOFF CONDITION (Corrected)	2570	2802
16	TAKEOFF C. G. IN (Fwd. or Aft.) IN.	109.0	
17	LESS FUEL	300	350
18	LESS AIR SUPPLY LOAD DROPPED		
19	MISC. VARIABLES		
20	ESTIMATED LANDING CONDITION	2270	2452
21	ESTIMATED LANDING C. G. IN (Fwd. or Aft.) IN.	108.0	

COMPUTED BY

STEP #4. Complete a set of copied forms for each unit aircraft. (NOTE: The shaded entries are the same for all OH-58s.)

STEP #5. Reproduce two copies of each form from Step #4.

STEP #6. Place a piece of transparent tape over the date block on each copy from Step #5 and enter the date in pencil.

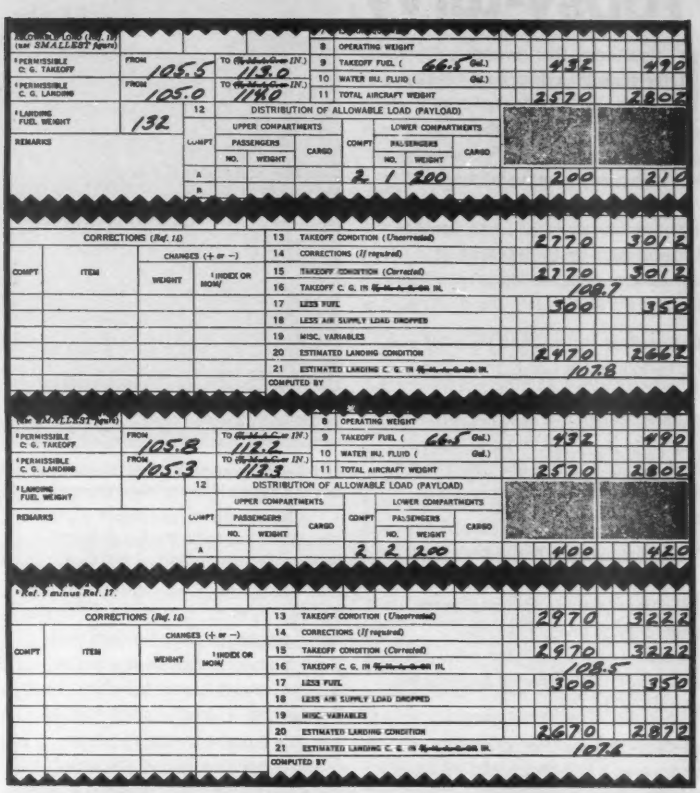
STEP #7. Place the original forms from Step #4 in the individual aircraft weight and balance file of the historical records.

STEP #8. Place a set of copied forms from Step #5 in the individual aircraft logbooks.

STEP #9. Place a set of copied forms from Step #5 for each aircraft in operations.

This completes all implementation requirements for AR 95-16. Now it is necessary for the weight and balance technician to review the original forms every 90 days and enter the new date on all forms.

Pilot, copilot and one passenger


8 OPERATING WEIGHT
9 TAKEOFF FUEL (66.5 Gal.) 432 490
10 WATER INJ. FLUID (Gal.)
11 TOTAL AIRCRAFT WEIGHT 2570 2802
12 DISTRIBUTION OF ALLOWABLE LOAD (PAYLOAD)
UPPER COMPARTMENTS
LOWER COMPARTMENTS
COMPT PASSENGERS NO. WEIGHT CARGO
A 2 1 200 200 210
B
CORRECTIONS (Ref. 14)
COMPT ITEM CHANGES (+ or −) WEIGHT INDEX OR MOM/
13 TAKEOFF CONDITION (Uncorrected) 2770 3012
14 CORRECTIONS (If required)
15 TAKEOFF CONDITION (Corrected) 2770 3012
16 TAKEOFF C. G. IN IN. 108.7
17 LESS FUEL 300 350
18 LESS AIR SUPPLY LOAD DROPPED
19 MISC. VARIABLES
20 ESTIMATED LANDING CONDITION 2470 2662
21 ESTIMATED LANDING C. G. IN IN. 107.8
COMPUTED BY

Pilot, copilot and two passengers

8 OPERATING WEIGHT
9 TAKEOFF FUEL (66.5 Gal.) 432 490
10 WATER INJ. FLUID (Gal.)
11 TOTAL AIRCRAFT WEIGHT 2570 2802
12 DISTRIBUTION OF ALLOWABLE LOAD (PAYLOAD)
UPPER COMPARTMENTS
LOWER COMPARTMENTS
COMPT PASSENGERS NO. WEIGHT CARGO
A 2 2 200 400 420
* Ref. 9 minus Ref. 17.
CORRECTIONS (Ref. 14)
COMPT ITEM CHANGES (+ or −) WEIGHT INDEX OR MOM/
13 TAKEOFF CONDITION (Uncorrected) 2970 3222
14 CORRECTIONS (If required)
15 TAKEOFF CONDITION (Corrected) 2970 3222
16 TAKEOFF C. G. IN IN. 108.5
17 LESS FUEL 300 350
18 LESS AIR SUPPLY LOAD DROPPED
19 MISC. VARIABLES
20 ESTIMATED LANDING CONDITION 2670 2872
21 ESTIMATED LANDING C. G. IN IN. 107.6
COMPUTED BY

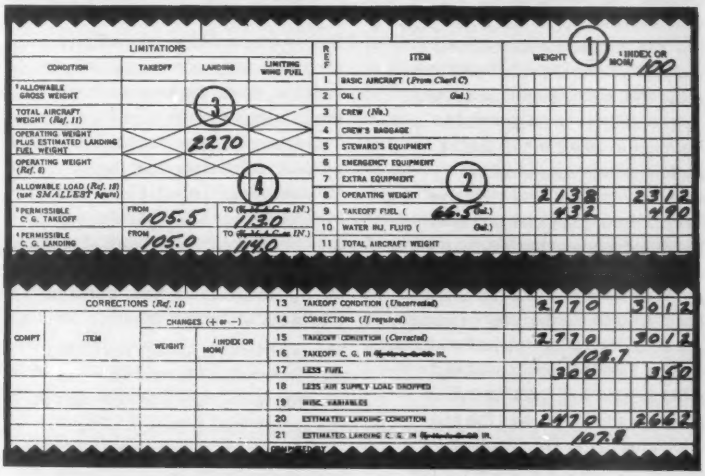
The most common errors observed on DD Forms 365F, other than clerical errors, are shown at right.

***1. The denominator of the moment should be entered here. This is especially important; for example, on the OH-6 where all denominators in the Operator's Manual are 1,000 and the denominator of the basic moment from the DD Form 365C is sometimes 100.**

***2. Takeoff fuel is usable fuel, less fuel burned during runup, figured from the appropriate performance charts. In aircraft with more than one fuel tank the location and amount of fuel in each tank must be entered in the remarks section.**

***3. This is the operating weight (Ref 8), plus the landing fuel weight (Ref 9 less Ref 17) and may or may not be the same as the estimated landing condition (Ref 20).**

***4. The permissible CG for takeoff and landing are the CG ranges from the Operator's Manual for takeoff weight (Ref 13) and landing weight (Ref 20).**


LIMITATIONS
CONDITION TAKEOFF LANDING LIMITING WING FUEL
ALLOWABLE GROSS WEIGHT
TOTAL AIRCRAFT WEIGHT (Ref. 11)
OPERATING WEIGHT PLUS ESTIMATED LANDING FUEL WEIGHT
OPERATING WEIGHT (Ref. 8)
ALLOWABLE LOAD (Ref. 10) (use SMALLEST figure)
PERMISSIBLE C. G. TAKEOFF FROM 105.5 TO 113.0 IN.
PERMISSIBLE C. G. LANDING FROM 105.0 TO 114.0 IN.
3
2270
4
1
2
ITEM WEIGHT INDEX OR MOM/100
1 BASIC AIRCRAFT (From Chart C)
2 OIL (Gal.)
3 CREW (No.)
4 CREW'S BAGGAGE
5 STEWARD'S EQUIPMENT
6 EMERGENCY EQUIPMENT
7 EXTRA EQUIPMENT
8 OPERATING WEIGHT 2138 2312
9 TAKEOFF FUEL (66.5 Gal.) 432 490
10 WATER INJ. FLUID (Gal.)
11 TOTAL AIRCRAFT WEIGHT
CORRECTIONS (Ref. 14)
COMPT ITEM CHANGES (+ or −) WEIGHT INDEX OR MOM/
13 TAKEOFF CONDITION (Uncorrected) 2770 3012
14 CORRECTIONS (If required)
15 TAKEOFF CONDITION (Corrected) 2770 3012
16 TAKEOFF C. G. IN IN. 108.7
17 LESS FUEL 300 350
18 LESS AIR SUPPLY LOAD DROPPED
19 MISC. VARIABLES
20 ESTIMATED LANDING CONDITION 2470 2662
21 ESTIMATED LANDING C. G. IN IN. 107.8

The method described is only a suggestion to ease the implementation burden and should not be interpreted as policy.

Topsy-turvy

It's a topsy-turvy world . . ." so goes the song. And it really can be, at least for helicopter pilots, as evidenced by the accompanying photo. Fortunately, all three crewmembers of this UH-1 escaped without injury except for a bit of embarrassment and a possible bruised ego—both the result of dynamic rollover during takeoff from **level** ground.

Impossible! Not so, and the pilot was no fledgling. He was highly skilled, proficient, and thoroughly experienced in this type aircraft. As a matter of fact, had he been fresh out of flight school, this accident most likely would have never occurred. Let's see why.

The mission was a limited maintenance test flight following adjustments made to the tail rotor pitch change links. The crew consisted of the pilot, the crew chief, and a technical observer undergoing on-the-job training.

Following takeoff, the pilot performed a HIT check and all hover checks; then, while on the downwind leg for landing, he noted that the right pedal was about 2½ inches forward of the left one. He requested permission to execute an autorotation to the autorotation lane. Permission was granted and he performed the autorotation, terminating it at a hover. He then landed the aircraft on a sod area near the runway where he and the crew chief discussed the adjustments made to the tail rotor pitch change links. After the crew chief explained the corrective action he had taken to correct a "right pedal out of rig" writeup, pointing out that the procedure followed was the one stipulated in the TM, the pilot decided to hover the aircraft to the parking ramp and seek additional assistance concerning the pedal problem.

As he applied collective to lift off, he turned to the right to check the clearance between his aircraft and one taxiing about 250 to 300 feet behind him. As the aircraft became light on its skids, it began a roll to the right, pivoting about the right skid. Both main rotor blades struck the ground, and the rotor separated from the aircraft. The UH-1 continued to roll until it came to rest inverted.

UH-1 assumed this unconventional attitude following dynamic rollover during takeoff from level ground.

It became apparent that the pilot had used an improper takeoff procedure (TC 1-35, task 2001) in that he attempted to take off and simultaneously clear the aircraft. In addition, it was determined that the tail rotor pitch change links were improperly adjusted because the TM procedure the crew chief had followed was incorrect. This resulted in reduced available right pedal and may possibly have contributed to an increased right rolling moment during takeoff to a hover, with the right skid on the ground.

The pilot failed to detect the rolling motion because his attention was diverted to the right and right rear of the aircraft during takeoff. This action resulted in inadequate visual cues and probably in an inadvertent right lateral cyclic input when he turned his upper body to the right, allowing the right skid to remain on the ground.

Further, seated in the right seat, he received inadequate warning sensations as the aircraft began to roll. When the left skid rose to a height of about 14 inches (8-degree roll), the pilot pivoted only about 4 inches. As the left skid reached a height of about 27 inches, his body moved only about 8 inches. Yet, at this point, the aircraft was at the critical angle of 15 degrees—the point of no return—when a rollover becomes inevitable. As a matter of fact, with the right skid on the ground, this critical rollover angle is reduced. Since dynamic rollover to the right can occur in a UH-1 in less than 2 seconds, the pilot's inattention during takeoff resulted in his detecting the rolling motion too late to effect recovery.

Curiously, an interesting fact that surfaced during the investigation was that the pilot was not fully aware that rollover could occur during a normal takeoff from level ground—a belief that contributed to his delayed reaction. Yet, as pointed out, the pilot was highly experienced, having logged more than 3,200 hours of flight time, 1,765 of which were in the UH-1. At the time of the accident, he was serving as unit operations officer, IFE, and SIP, as well as maintenance test pilot.

Pursuing the matter further, it was found that this belief concerning dynamic rollovers is shared by a substantial percentage of experienced aviators.

It appears that pilots seem to associate dynamic rollover primarily with slope landings and takeoffs, particularly under crosswind conditions. In doing so, they tend to discount the possibility of rollovers during normal flight from level ground. As this accident proves, dynamic rollovers are not confined to slope operations. And the best preventive medicine is concentration.

Basically, the pilot involved in this accident attempted to perform two tasks simultaneously, each of which demanded concentration. While the human body is capable of mechanically performing more than one action at the same time, the human mind tends to be distracted by what appears to be the more critical task. This is precisely why this type of accident is more apt to involve an experienced aviator. An inexperienced pilot, knowing his limitations, would have leaned toward caution. He may even have been overly cautious, but he would have cleared the aircraft first so that he could devote his full attention to the takeoff. Consequently, he would have concentrated on one task at a time. While this accident illustrates that experience alone does not guarantee safety, investigation uncovered other significant facts that can affect safety.

Although the pilot involved in this accident was qualified to perform maintenance test flights, he did not possess an extensive maintenance background as recommended by TM 55-1520-328-25, par. 3-3a. Other maintenance test pilots with extensive maintenance experience were available to perform test flights on the unit's aircraft. Considering that the pilot who conducted the test flight also had the responsibilities of operations officer, unit IP, and instrument flight examiner, possibly he should not have been burdened with the additional responsibilities of maintenance test pilot.

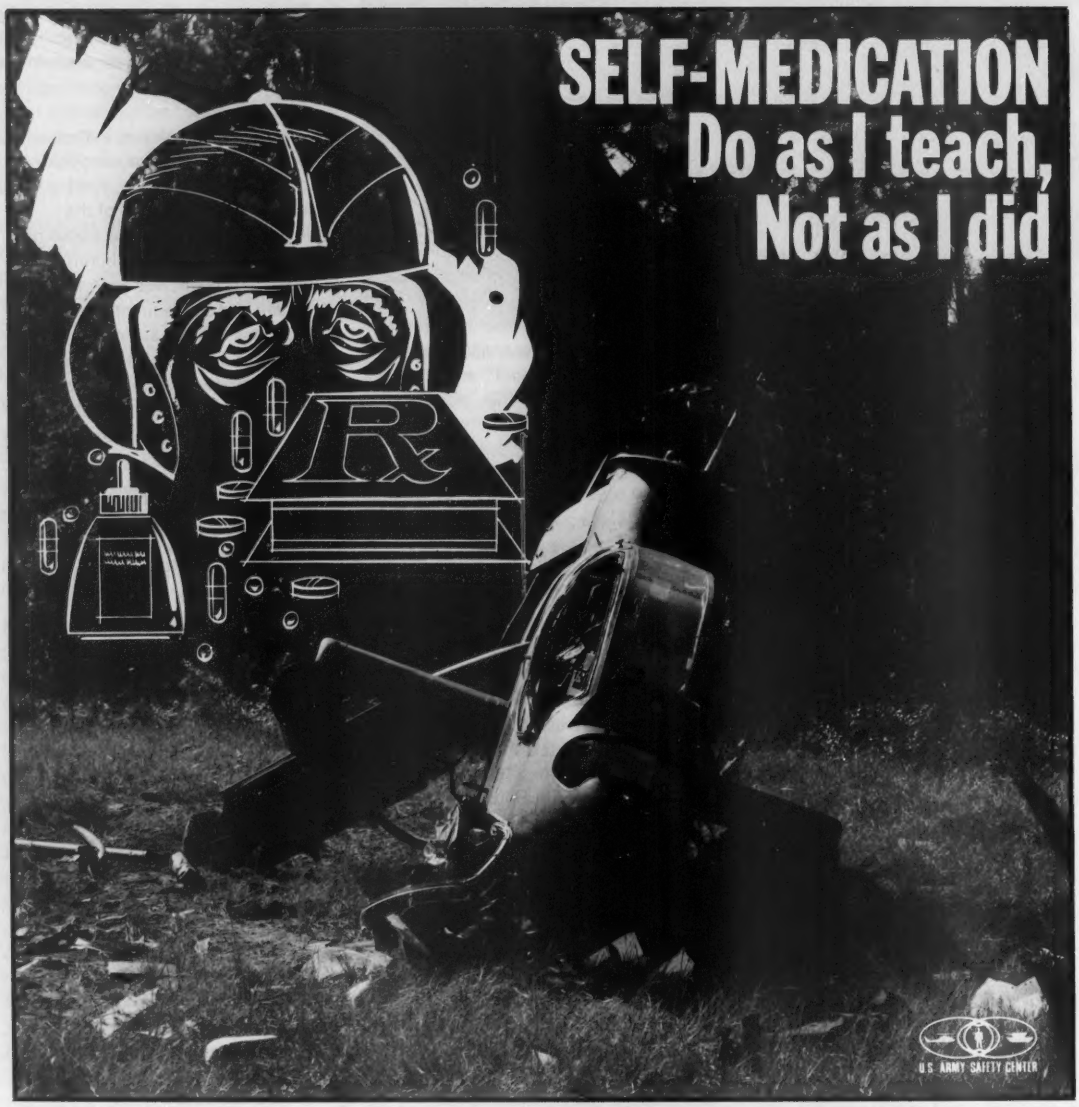
The crew chief improperly adjusted the tail rotor pitch change links by extending them to correct an excessive right pedal condition. He did so because the instructions in TM 55-1520-210-23-2, par. 11-110b, were wrong. An urgent change to this TM has since been sent to the field, correcting this discrepancy. However, the point is this: Anyone who finds an error in a TM has authority—in fact, responsibility—for submitting a DA Form 2028 (Recommended Changes to Publications and Blank Forms) or a DA Form 2028-2 (Recommended Changes to Equipment Technical Manuals). This is our principal means for getting rid of any errors in our manuals. Considering the number of UH-1 aircraft being maintained by Army and civilian personnel, it is hard to believe that corrective action was not effected before this accident occurred. While most errors found in TMs may be inconsequential, some can result in mishaps.

Additionally, the symbol assigned the writeup, "tail rotor out of rig," was a red diagonal instead of a red X. This error was compounded by the crew chief who entered the corrective action as "tail rotor pitch change links removed/tail rotor pitch change links replaced." As a result, the TI insured only that the pitch change links had been properly installed, and did not inspect the tail rotor rigging.

In the past, use of a wrong status symbol has resulted in catastrophic accidents. In one instance, a red diagonal was used instead of the required red X to denote the status of a U-8. This permitted the aircraft to be flown. The result was an in-flight engine fire and subsequent loss of a wing. It goes without saying that all maintenance personnel should be thoroughly knowledgeable in the use of proper status symbols as well as in accurately describing any corrective actions accomplished.

Finally, during a test conducted after the aircraft had been recovered to the unit's hangar, the pilot's door jettison mechanism failed to release the door. Inspection revealed the top pin was rusted in its hinge. Although inspection of door jettison mechanisms is performed every 100 hours of flight, corrosion was not detected because aircraft in this unit might be operated 6 months to a year before accumulating 100 hours of flight. Considering these aircraft are operating in a high humidity environment, the solution lies in regulating inspection frequency on a calendar basis as well as on the number of hours flown. In short, unit commanders in similar situations should initiate a local corrosion prevention program specifically tailored to meet their unit and environmental needs as outlined in TM 43-0105, par. 2-9d.

The world may not always look rosy, but, at least, it looks best when viewed right side up. So, when it comes to dynamic rollovers, every helicopter pilot should thoroughly understand not only what causes them, but most important, how to prevent them.



Major Peter J. Edgette

Major Edgette is a Medical Service Corps officer. He has his Masters in Hospital Administration from Baylor University and a Masters in Public Administration from the University of Northern Colorado. He is currently commander of the 57th Medical Detachment, Fort Bragg.

BY WAY OF introduction I would like to refer you to the June and July 1978 issues of the *Army Aviation Digest* ("Altitude Physiology Training—Yes or No" in the June issue and "Stresses Encountered Before Flight" in the July issue). When I wrote those articles, I was assigned to the U.S. Army Aeromedical Center, Aeromedical Activity, Fort Rucker, as an instructor. I viewed the publishing of articles in the ***Aviation Digest*** as an extension of my teaching/instructing. I was responsible for teaching the entire aeromedical block of instruction—altitude physiology, night vision, stress and fatigue, and one particular segment of instruction entitled "Aviation Medicine." The classes were and presently are taught to initial entry students and a combination of these classes is taught in the transition courses at Fort Rucker.

Back to the particular subject of instruction mentioned above—aviation medicine. I am sure all of you who have attended the Initial Entry Course especially remember not the instructor as much as the cute slides depicting a flight surgeon wearing a modified Mickey Mouse hat with a rotor attached. Captions such as "The flight surgeon is your friend" and "Don't self-medicate" were tossed about the classroom and openly discussed by whomever. I can remember, clear as day, getting wrapped around the axle in discussing what medication we as aviators can take without a prescription. The discussion even went so far as aspirin and the letter of the law. Could we as aviators self-medicate with aspirin?

I must have taught that class more than 300 times. I distinctly remember bringing to class one type of training aid, a copy of *U.S. News and World Report* which had an article titled "Over-the-Counter Prescriptions." The article stressed the idea that the various daytime calmatives calm you by making you drowsy in your seat, and that the last thing a heavy equipment operator or an airline pilot needs is to be drowsy in his seat. Enough of the introduction.

The title of the article you are reading/scanning/burning/using in any of a number of ways I can imagine is "Do As I Teach, Not As I Did." The sad point of this particular title is, hopefully, a vivid picture of what could happen with self-medication.

My current assignment is that of a Dustoff unit commander. In that capacity I spend most of my time on the ground but occasionally, as my SIP would put it, manage some field grade flying.

About three months ago, I was sitting in my office, talking to one of the pilots, when I developed a sinus headache. I imagine I am normal when it comes to sinus cavities. I have them just like everyone else, but my sinus headaches must be the worst torture in the world. I don't want to talk, I don't want to be in bright light, I don't even want to walk. All I want is to lie down and go to bed. With this in mind, you can imagine how I started to feel knowing a sinus headache was approaching. I don't want you to get the idea that I have all kinds of time to prepare for a sinus headache. I pass through stages of discomfort just like anyone else. On with the story!

I have known for years that self-medication is taboo. I realize I should not take medication prescribed for a prior illness nor medication prescribed for another member of my family, but remember, I had this awful sinus headache. I remembered a small bottle of Novahistine DM in my desk. I honestly can't remember where I picked it up but the expiration date was June 81 and it was an antihistamine. I wasn't scheduled to fly that day, but unfortunately, I didn't even consider that crucial factor.

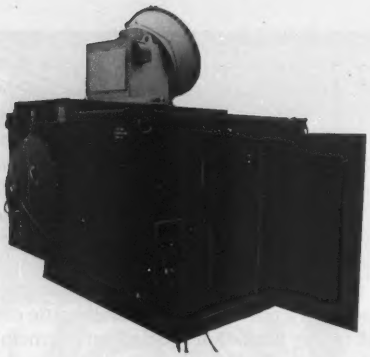
After opening the bottle I took a small swig, about one teaspoonful. For one reason or another I looked at the clock. It was 1500. I continued with some paperwork, not even giving my self-medication a second thought, when all of a sudden I began to sweat profusely. I noticed the time. It was 1515. My pulse rate became very rapid and my vision blurred. I felt hot all over and tried to get up from my seat. My admin officer looked over at me and said, "You look like a ghost. What's wrong?" I muttered something and could not even stand up. I thought that I must be having a heart attack. I had never felt that way before.

After sitting there for a few minutes I remembered the self-medication. All of the classes I had taught concerning aviation medicine flashed through my head. Why did I take that medicine?

I finally managed to get downstairs and across the parking lot to the flight surgeon. I must have still looked terrible because the medic came around the counter and had me sit down. I told the flight surgeon what had happened and showed him the partially consumed bottle. He immediately grounded me and told me exactly what I had taken. Novahistine DH contains codeine and a warning about possible drowsiness for people who operate heavy machinery. I had a severe reaction to the drug.

What if I had been scheduled to fly that day? I realize that with the sinus problem I could not have flown, just as I realize I should not self-medicate. But, what if I had completed my preflight at 1500 that day and at 1515 had been IFR at 6,000 feet?

I was fortunate that afternoon in that I was not scheduled to fly and that I did not suffer any permanent damage. I cannot stress, teach, instruct enough concerning self-medication. Please, don't self-medicate. The responsibility rests with you.



GRETA HAS ARRIVED

Major James E. Johnson
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WHEN KING ARTHUR'S knights mounted their steeds and went into battle, they were protected from the dragon's fire or the opponent's sword by a suit of armor.

When Army aviators mount their helicopters to go into battle, neither their "steed's" airframe nor their Nomex is going to offer much defense against the enemy's air and ground fire. So these modern-day warriors have to depend on other assets to help them survive.

One such asset is the AN/APR-39(V)1 warning receiver with which most Army helicopters are or will be equipped. When a threat radar system is scanning the battlefield in search of a target, the aircrew will get an audio signal and a visual display on the cathode ray tube of the warning receiver. These signals will change if the radar detects and acquires the helicopter, so the crew will know the dragon is about to spit fire. The signals also will reveal what the threat is and its approximate location, allowing the pilot to decide whether to take evasive measures or to stand and fight.

But how does an Army aviator learn to use the warning receiver, other than by encountering real dragons? Up to now the answer has been through textbooks, lectures and TV tapes, with very limited active simulation.

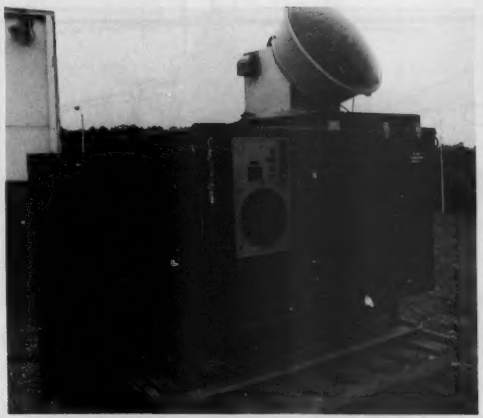
GRETA (ground radar emitter for training aviators) has changed that!

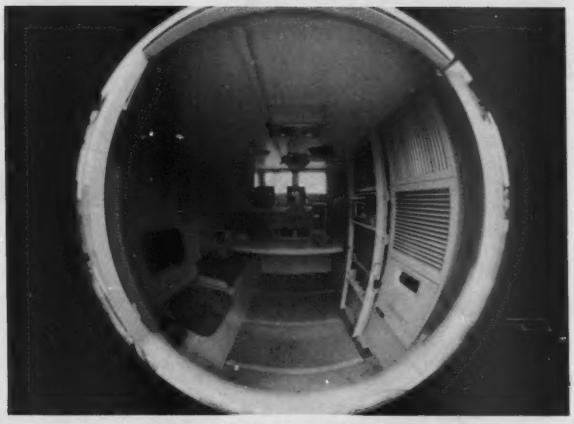
Formerly called TRTG (tactical radar threat generator), GRETA is housed in a small shelter mounted on a pickup truck. It emits signals which represent a variety of radar threats, and those are transmitted to a helicopter's AN/APR-39(V)1. The representative signals are presented by the radar warning receiver in various strobe sizes and tone sounds, so the aviator can learn to distinguish which threat radar is involved.

GRETA's operator can use radar and optics or a combination of those to instruct the student. In the optical mode, the pilot's reactions in the various flight situations can be seen by the operator, and there also can be radio contact between them.

The GRETA shelter holds two people, while others can observe the training sequence from outside the shelter, using GRETA's remote video capability.

Another feature of this device is a numerical data display which depicts date, time, mission number, aircraft involved, training site, and other items to include real time range and azimuth to the target aircraft. This infor-

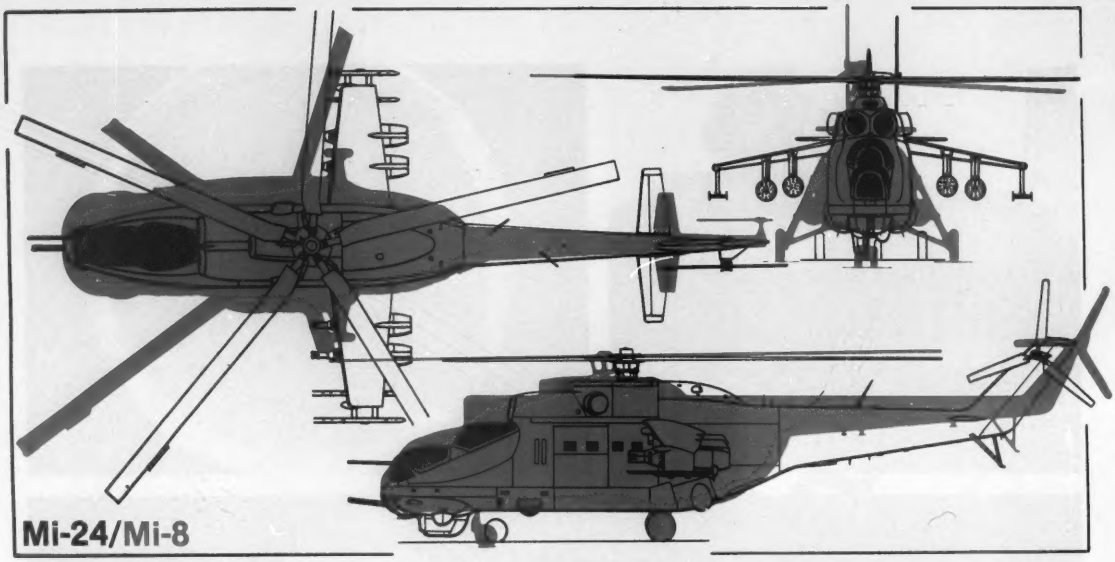




mation, together with the video portion of the training exercise, may be recorded for later use in briefings and critiques.

A major advantage of GRETA is in its mobility. This mobility permits realistic combat skills threat training to take place within an operational environment. This training will be provided to both the initial entry student aviator and to the qualified aviator to maintain proficiency at the unit level.

Such proficiency could sometime be all that stands between an Army aviator and the dragon's fire when they're engaged in battle.



The HIP Bus, Gunship Or Both?

THREAT

Captain Carl E. Daschke
Threat Branch
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A GREAT DEAL of interest and concern has been expressed by the military toward the Soviet's newest and most sophisticated attack helicopter—the Mi-24 HIND-D and newer HIND-E. Few people can ignore the threat to our forces which the HIND represents, but what about their other helicopters?

While much of our attention has been directed towards the high technology of the sophisticated attack helicopters, we may have failed to recognize lesser developments and additions to the older helicopters.

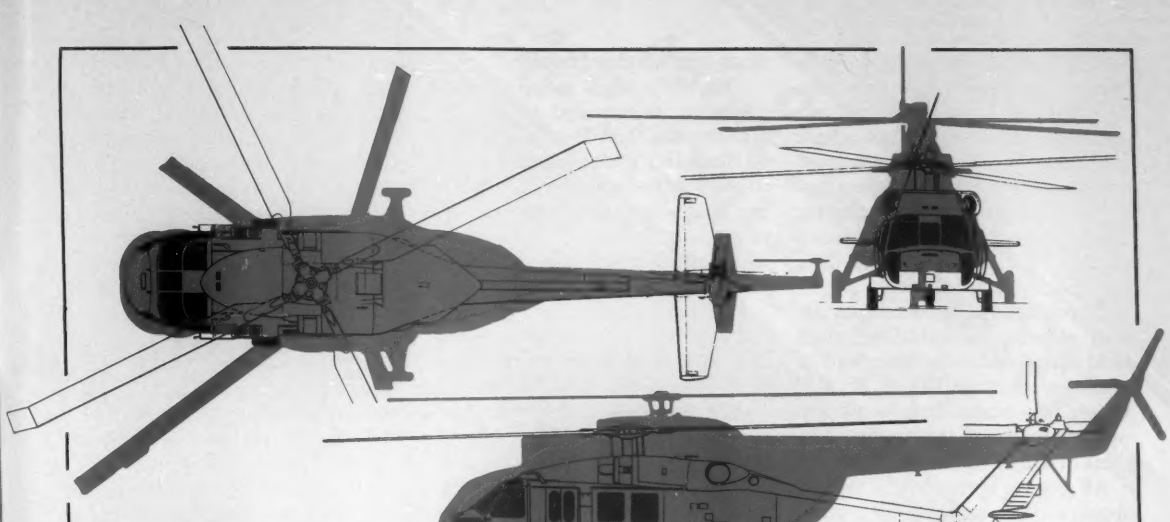
The Mi-8 HIP was first displayed by the Soviets in 1961. Since that time more than 6,000 HIPs have been produced for both civilian and military use.

Four versions of the Mi-8 have been developed: The HIP-A was powered by a single 2,700 shaft horsepower (SHP) turboshaft engine and a four-bladed rotor system. Later HIPs were fitted with the now standard five-bladed rotor system and were designated the HIP-B. In 1962 a twin-engine version was developed, which since has become the standard, known as the HIP-C. The armed version, the HIP-E, has been described before Congress as the world's most heavily armed helicopter.

Both the Mi-8 (NATO term), and the B-8 (civilian version) were fairly sophisticated for their time. In fact, according to Soviet sales brochures, when the aircraft was exhibited at the 26th Paris Air Show it was proclaimed as "the most outstanding achievement in the field of the helicopter building industry." While some may question this proclamation, the aircraft does have some interesting features and has been credited with several speed and endurance records.

During the early 1960s the HIP achieved several records for speed and distance, proving, to the Soviets, its airworthiness and reliability. For example, in 1966 the Mi-8 successfully flew from Moscow to Osaka, Japan and back. In 1979 three international women's helicopter records for speed and distance in a 2,000 kilometers (km) closed circuit course were credited to the Mi-8.

To facilitate all-weather operations the aircraft's designers have provided a rather extensive array of flight and navigational systems. Included in the HIP's instrumentation are:



UH-60/Mi-8

• A four-channel autopilot which automatically ensures helicopter stabilization in flight with regard to roll, yaw, pitch and altitude. The autopilot has the ability to operate in both the automatic stabilization mode and the combined differential mode which assists the pilot in control of the helicopter. Stabilization is available when the aircraft is hovering as well as in normal flight.

• Twin sets of gyro artificial horizons, airspeed indicators, altimeters, climb indicators, main rotor tachometers; and radio altimeter, radio compass, and air astro-compass for polar flying. The last being extremely important since the HIP is used extensively in the USSR's polar region.

• For communications, the aircraft is equipped with both high frequency and very high frequency radios which allow the aircraft to communicate out to a distance of 540 nautical miles.

• The avionics are further complemented by the use of a radio telephone, an automatic radio compass and a radio altimeter with a terrain warning capability.

• Additionally, an oxygen supply system is installed in the helicopter for use by the crewmembers and, if configured as an air ambulance, the patients also can be supplied with oxygen.

The standard Mi-8 HIP-C with a five-bladed rotor system is powered by two 1,500 SHP model 7B2-117 turboshaft engines. The engine automatic control system maintains the main rotor speed within predetermined limits, equalizes the power of both engines and automatically increases the power of one engine should a failure or shut-down occur in the other.

The engines are fueled by a system which consists of one internal fuel tank and two external tanks, located along the sides of the fuselage for a total capacity of more than 3,100 pounds of fuel. The internal service tank is automatically replenished from the external tanks, eliminating the need for manually checking and switching tanks. To permit ferry missions or extended flights, a supplementary fuel tank can be mounted in the cargo compartment.

Hydraulics for the HIP are provided by two self-contained systems, main and auxiliary. Each operates from separate pumps which are automatically controlled to change from main to "aux" should a failure occur.

The aircraft is equipped with an automatic fire extinguishing system to protect the engine compartment, fuel tanks and main gear box areas. And, in an effort to enhance flights under icing conditions, the HIP employs an automatic electrothermal deicing system to deice the leading edges of the main and tail rotors and the crew's windscreen. The engine air intakes are heated by hot air supplied from the engine compressor. The extensive deice system allows the aircraft to operate throughout the wide, severe temperature spectrum of the Soviet Union, as well as in the climates of the various countries which import the Mi-8.

The HIP was designed to be easily maintainable and to operate out of both improved and field service facilities. The manufacturer claims that "helicopter servicing under out-of aircraft conditions is an easy task" due to the accessability of major components. For example, the engines, main gear box compartment, hydraulic panels, swashplate assembly and main rotor hub can be inspected and serviced without

the use of special ground equipment. The engine side cowlings, when in the open position, form work platforms for maintenance personnel to service the engine, transmissions and main rotor components. The platforms are accessible through a hatch located in the crew's cabin. This eliminates the need for external ladders or steps.

The self-contained platforms not only provide a suitable means of field maintenance but also tend to minimize damage to the aircraft which may result from a person walking on top of the "softer" portions of the aircraft's fuselage.

All aspects considered, the HIP appears to be a rugged, easily maintainable aircraft capable of operating from a variety of mission sites.

The HIP, or B-8 as it's called by the Soviets, has seen extensive service with the Soviet national airline Aeroflot and is rapidly becoming the primary transport helicopter of the Soviet tactical helicopter regiments. According to the latest version of ***Jane's,*** it is being extensively exported to the Warsaw Pact and Non-Warsaw Pact countries around the world.

The HIP's flight characteristics, although not necessarily as impressive as the HIND's or comparable NATO aircraft are as follows:

Crew . . . . . Two pilots and flight engineer
Maximum Speed . . . . . 230 Km/hr
Cruise Speed . . . . . 200 Km/hr
Maximum Altitude . 14,400 Ft AGL
Flight Range . . . . . 450 Km
W/Internal Ferrytank . . . . 650 Km
Fuel Consumption:
At takeoff rpm . . . . . 295 g/hr
At cruise rpm . . . . . 330 g/hr

Both the civilian version and the military configured HIPs can transport 28 passengers or 24 lightly equipped troops. All versions can be converted to perform medical evacuation missions, accommodating 12 stretchers and tip-up seat for a medical attendant. Additionally the HIP can be configured with an electric hoist mounted in the cabin door or a slingload hook.

The HIP's larger troop carrying capacity, as opposed to its U.S. counterparts, the UH-1 Huey or UH-60 Black Hawk, allows each aircraft to carry almost a platoon of infantry per helicopter—thus reducing the command and control problems which often result in confusion upon arrival at the designated landing zones.

The aircraft's larger troop capacity also allows a lesser number of aircraft to insert a more significant sized force in terms of firepower. This is a critical point when one considers rear area operations where limited aircraft "lifts" could be used to insert Soviet forces into our rear areas while greatly reducing the chances of our detecting their flight.

Incidentally, in support of airmobile operations the HIP-C normally is armed with 16-shot rocket pods to provide suppressive fires for the landing forces and to provide supporting fires for the ground forces to further complement the airmobile forces ability to "stay and fight." The Mi-8 HIP-E was only recently introduced.

The "E" has a flex-mounted 12.7 millimeter (mm) machinegun mounted in the nose, and an outboard rack mounted on each side of the aircraft's fuselage upon which are mounted six 36-shot 57 mm rocket pods for a total of 192 rockets, four antitank guided missiles, and provisions for general or multipurpose bombs. The HIP-E can be expected to be employed in both the armed escort and/or attack helicopter roles, that is, both accompanying transport aircraft, and remaining in support of the ground forces as long as fuel load will allow.

Since we are addressing airmobile operations, I think that it is necessary to point out some of the more current Soviet airmobile concepts. Unlike the U.S. the Soviets do not have any "airmobile divisions." Rather, they believe that any well trained motorized rifle organization (normally battalion level) can be effectively trained and employed to conduct successful heliborne assault. This particular concept is not completely foreign to U.S. forces since the U.S. Marine Corps also believes that heliborne operations are a normal infantry mission.

Generally, Soviet heliborne or airmobile operational planning is conducted at division or higher level with the mission of securing key terrain and interdiction of logistical, communications, nuclear facilities and airfields as primary targets.

Airmobile operations usually originate from pickup zones, located 15 to 20 kilometers behind the forward edge of the battle area (FEBA), with the unit being inserted up to 80 kilometers behind our lines (most common insertions occur between 10 and 15 km behind our FEBA). Flight routes will be assigned along terrain which minimizes exposure to enemy air defense, with supporting fires provided by escort helicopters, artillery and high performance aircraft flying cover.

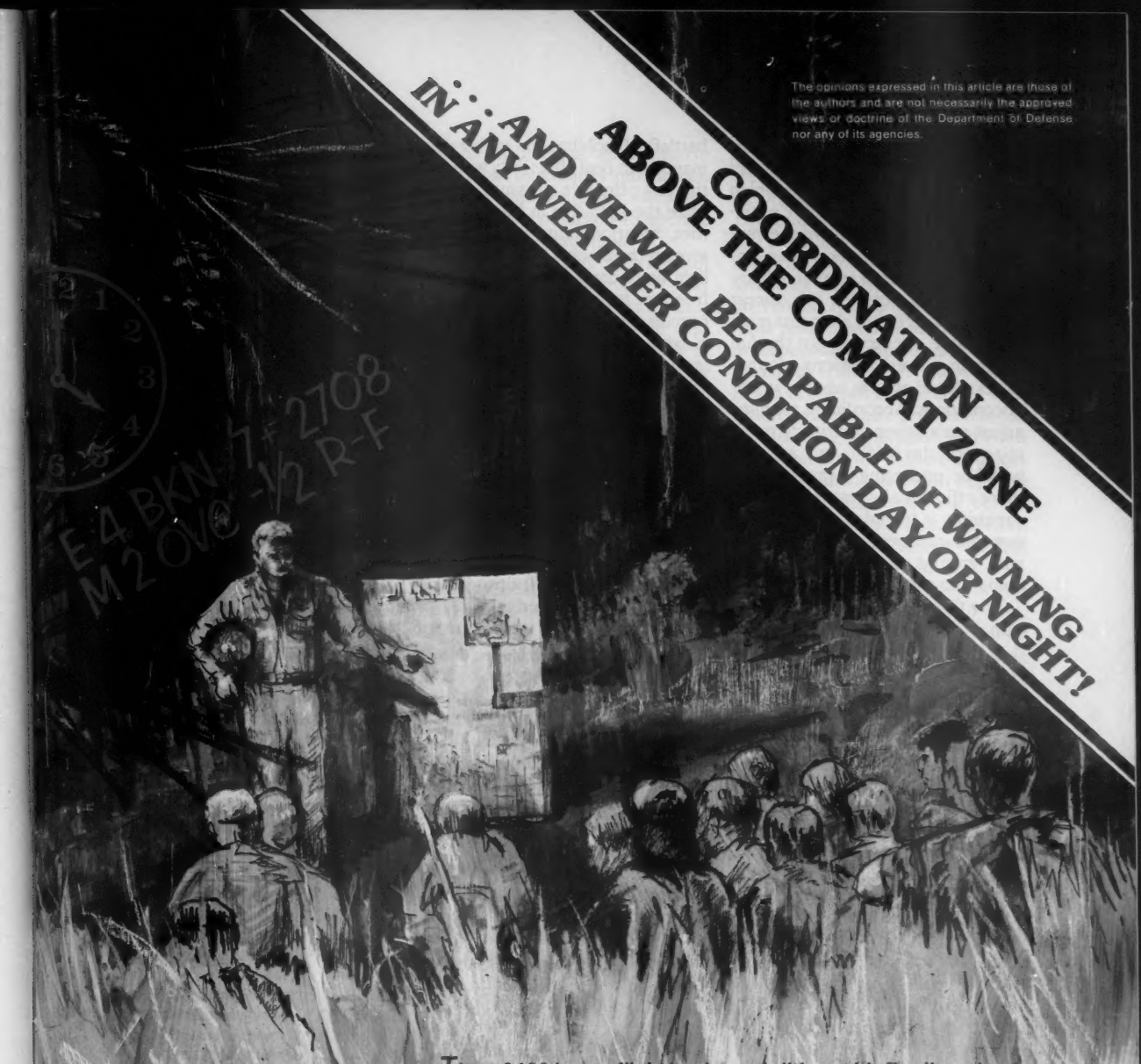
Airmobile operations normally are planned to provide a link-up with ground forces within 18 to 24 hours—seldom will the link-up be delayed any longer. The airmobile or heliborne assault is still in the evolutionary stages within the Soviet military. They have observed U.S. efforts in this area for many years, learning from our experiences those concepts which fit their particular tactical requirements. Additionally, we can expect some refinements to result from the Soviet's current involvement in Afghanistan.

The Mi-8 HIP, although less glamorous than its attack helicopter relative the HIND, is a versatile aircraft capable of accomplishing a myriad of combat and noncombat missions. Its extensive employment by Soviet and non-Soviet countries—coupled with the widespread acquisition of the aircraft by numerous countries throughout the globe—virtually ensures that you, as Army aviators, will encounter this aircraft in any conflict which may occur around the world.

COORDINATION ABOVE THE COMBAT ZONE

. . . AND WE WILL BE CAPABLE OF WINNING IN ANY WEATHER CONDITION DAY OR NIGHT!

The opinions expressed in this article are those of the authors and are not necessarily the approved views or doctrine of the Department of Defense nor any of its agencies.



Major William E. Coleman
Directorate of Combat Developments
U.S. Army Aviation Center
Fort Rucker, AL

and

Dr. Jack H. McCracken
Research Psychologist
U.S. Army Research Institute Field Unit
Fort Rucker, AL

Time: 0400 hours, flight leaders morning briefing.

Today we will be supporting the 1st Brigade, 52d Armored Division. Intelligence predicts this brigade will be facing a motorized rifle division that will be attempting a penetration before first light. We must be in position and be prepared to engage the enemy prior to the initial attack. Our departure and arrival times will be published. G-2 has given us an estimated 400 feet broken condition with 7-miles-plus in visibility 1 hour after sunrise. Present weather is reported to be 200 overcast with less than one-half mile visibility in light drizzle and fog.

Could you handle this mission? What procedures would you expect to use? Is your aircraft properly equipped to handle inadvertent instrument meteorological conditions? When was the last time you flew tactical instruments?

Future combat with our most likely adversaries raises the prospect of an around-the-clock battle which is highly mobile and fluid. Continuous, unrelenting offensive pressure in all weather conditions is a primary feature of their current military doctrine. To counter this threat U.S. Army Aviation elements must be capable of carrying out the full spectrum of our missions around-the-clock and often in adverse weather conditions. Accordingly, we must adjust our aviation doctrine to maximize our day/night and adverse weather operating capability. A more efficient all-weather aviation capability is technically feasible as new and improved aircraft systems and ground support equipment come into the inventory.

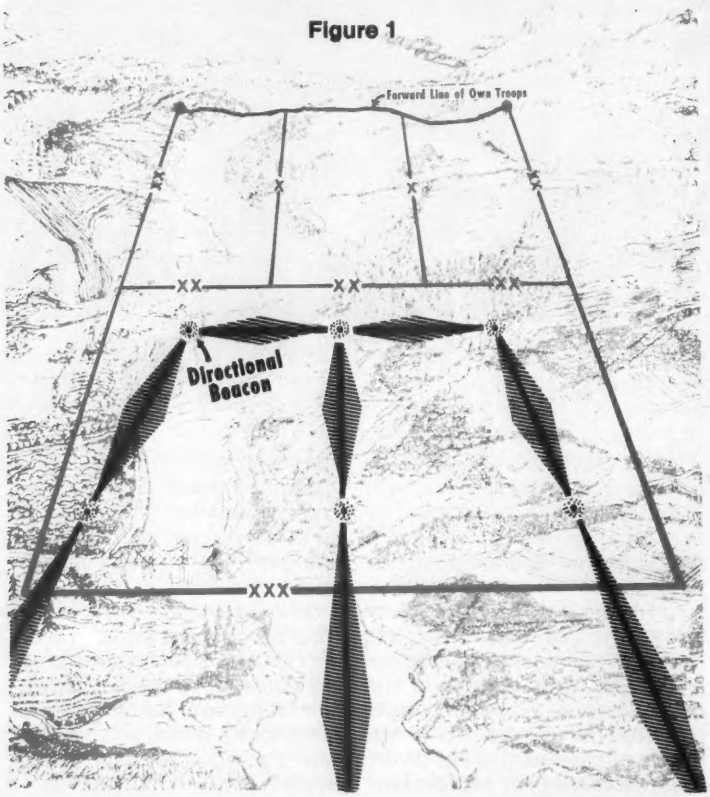
The threat has forced an expansion of requirements relating to battlefield mobility. To enable commanders to deal effectively with continuous offensive pressure, and to seize the initiative in future hostilities, aviation units must operate around-the-clock. Operating in daylight visual conditions allows greatest freedom for maneuvering and will remain the preferred mode of employing aviation assets. However, tactical situations will develop in adverse weather conditions (and at night) in which the ground commander will want to employ airpower. During winter months central Europe is a region of considerable cloudiness and reduced visibility.

Operating at reduced altitudes in instrument meteorological conditions, the aviator has little margin for error in terms of altitude and course deviation. Reduced safety margins increase the importance of proper equipment, pre-mission planning, established air traffic control procedures and aircrew proficiency.

In order for aircraft to survive during instrument flight operations in a hostile environment, pre-mission flight planning requires careful analysis of factors such as aircraft instrumentation, route selection and threat air defense capabilities. Altitudes available for instrument flight will be limited and must be carefully selected based on obstacle clearance and threat air defense posture. Generally, the altitudes at which instrument flight can be conducted safely will increase in relation to the aircraft's distance from the forward line of own troops. Mitigating factors, such as terrain masking, aircraft survivability equipment and attrition of enemy air defense systems may increase the altitudes at which flight can be safely conducted close to the line of contact.

With these thoughts in mind the ideals for instrument flight control within the brigade, division and corps will be discussed. Some of the requirements are met by present capabilities, some are in the study stage, while others are reflections

Figure 1



Glossary

ADA	air defense artillery
CAME	corps airspace management element
CRC	control and reporting center
CRP	control and reporting post
DAME	division airspace management element
divarty	division artillery
FACP	forward air control post
FCC	flight coordination center
FLOT	forward line of own troops
FM	field manual
FOC	flight operations center
medevac	medical evacuation
OPORD	operations order
QUICK-FIX	UH aircraft with special equipment for communications intelligence
RPV	remotely piloted vehicle
SOP	standing operating procedure
SOTAS	Standoff Target Acquisition System

of the authors' beliefs of what is needed if future battles are to be won.

Coordination Among Brigade, Division and Corps Airspace

Operations in the brigade and division rear areas. To reduce the requirements for control of instrument traffic, instrument flight in brigade areas will be minimized. Whenever possible flight operations in these areas will be conducted under day/night visual conditions using terrain flight techniques. However, there will be circumstances in which terrain flight tactics will have to be supplemented with tactical instrument procedures.

A disadvantage inherent in terrain flight is that aircraft must often be flown at slow airspeeds. Also, courses flown cannot always be direct but must deviate to follow and make use of available terrain features. The resultant increase in flight time using these techniques may become critical when mission success depends on quick reaction time or when in a low fuel condition. In such circumstances it will sometimes be necessary for aircrews to climb to a safe obstacle clearance altitude and proceed using tactical instrument procedures. Accordingly, aircrews operating in visual conditions above the main battle areas (MBA) must understand *"the division instrument flight control procedures."* Aviators must be proficient in tactical instrument flight techniques and mission planning must routinely allow for the possibility of having to operate in instrument conditions.

To keep aircrews informed of instrument conditions which may be encountered the division must provide timely and accurate area weather information, especially at night when fog and reduced visibility are more prevalent and difficult to detect. When missions require flight operations in instrument conditions, the division also must provide for safe and expeditious aircraft routing.

Control of Air Traffic in the Division. The division airspace management element will be responsible for establishing tactical instrument routes and procedures in the brigade and division rear areas. The division's instrument flight control procedures will be included as an annex to its OPORDs. The DAME will coordinate with the corps airspace management element to ensure compatibility of division routes and procedures with the corps system. Implementation of the DAMEs procedures for coordination and control of instrument flight within the division will be the responsibility of the division flight coordination center.

Route selection should allow for aircraft movements, both parrallel and perpendicular to the FLOT, and for recovery of aircraft from the brigade to the division rear areas. The number and location of routes will depend on terrain, number of anticipated aircraft movements and threat air defenses. These tactical instrument routes will provide for mass movements of aircraft while incorporating appropriate safety measures (figure 1). Mass movements of aircraft in instrument conditions will require procedures for maintaining separation between individual aircraft. In these instances it is our opinion that positive control and other procedures will be designed to achieve longitudinal and lateral separation before vertical separation is attempted.

Each division will maintain two or more terminal approach sites. One or more of these sites will be designated for handling logistical/medical support for the division. An additional site will be designated for special use aircraft such as SOTAS, QUICK-FIX, etc., which usually will be operated away from the logistical/medical sites. At least two of the terminal approach facilities in each division rear area will normally employ precision approach equipment. Other navigation equipment may be used as a backup or to augment precision approach aids. The DAME will be responsible for selecting the numbers and placements of terminal approach sites within the division. The division commander or staff will specify the hours of operation and when terminal approach sites are to be moved (figure 2).

An essential element of the DAME management plan will be the establishment of communications requirements. All division airspace users must be integrated into a common communications network. The division communications plan also must make provisions for aircrews operating without radio communications. Whether the result of equipment failure or imposed radio silence, it probably will be necessary at times

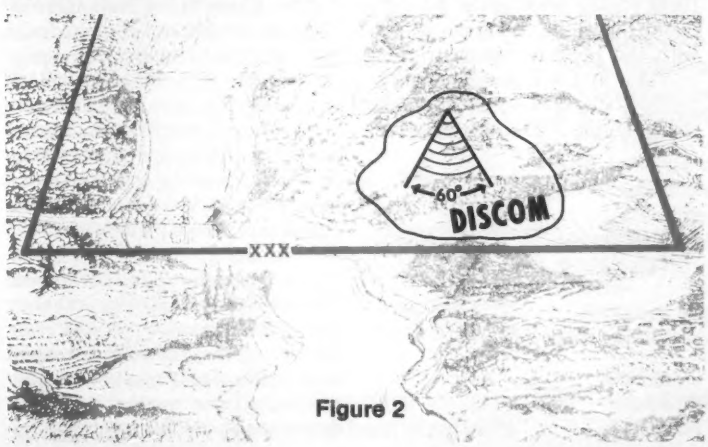


Figure 2

for aircrews to return from missions without the aid of two-way radio communications. In order to allow for contingencies such as this the DAME must establish an SOP for lost communications. The procedures should provide aircrews with maneuvers or other means of identification by friendly forces as well as emergency routes and landing or let down zones.

Coordination of Air Traffic Between Corps and Divisions. Corps aircraft normally will enter the division rear areas at preselected entry points during visual flight conditions. The CAME will establish standard-use Army aircraft routes and publish them in the corps OPORD. Primary users of these routes will be logistical and medevac aircraft. Airspace users will be given timely information when any of these routes are changed. Air Force aircraft and Army air defense units will avoid operating along these avenues unless prior coordination has been effected with the CAME.

Corps aircraft flying under instrument conditions within the corps rear area will be managed by the control and reporting center and flight operations center procedures. Army aircraft en route to division rear areas under instrument conditions will contact the FOC for positive control. In coordination with the CRC the FOC will assign these aircraft safe altitudes and routing into division rear areas. Lateral, longitudinal and limited vertical separation will be employed for mass aircraft movements. The FOC will contact the appropriate division FCC and provide information on the number of aircraft arriving in the division areas and the estimated times of arrival. We believe the FCC will have positive control over aircraft in its area of responsibility.

Army and Air Force managers will coordinate the use of airspace above the corps/division areas. The CAME/DAME will be responsible to their respective commanders for the effective management of the airspace under Army control.

Air Force aircraft entering the division under instrument flight conditions will be controlled by a CRC/CRP/FACP normally located in the corps areas. Air Force aircraft will not be vectored through an Army tactical instrument route without prior coordination with the FOC (figure 3).

Coordination of Operations by Special Use Army Aircraft. Special use aircraft, such as SOTAS and QUICK-FIX, require procedural consideration beyond that discussed for other Army aircraft, since their intelligence missions are performed above terrain masking altitudes. SOTAS aircraft will take off from division rear areas, climb to mission altitudes and recover to the division rear areas when missions are complete. The SOTAS will contact the FCC for climb clearance and control procedures. ADA will receive the flight profile prior to the aircraft's takeoff. The FCC will coordinate with the FOC to obtain a climb corridor and will provide positive control to the SOTAS aircraft. Upon climbing out of FCC's areas of responsibility the SOTAS will be passed off to an Air Force control center for continuous positive control.

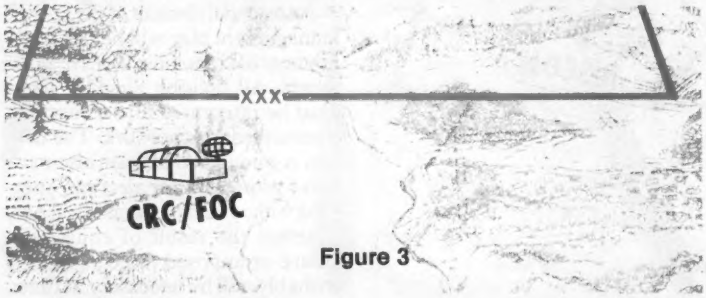


Figure 3

QUICK-FIX aircraft will be operated in the brigade sector. These aircraft will take off, climb and return to base using see-and-be-seen procedures. When QUICK-FIX aircraft operate in instrument conditions they will coordinate flight profiles in the same manner as described for SOTAS aircraft. Artillery remotely piloted vehicle flights will be coordinated with the DAME and flight profiles passed to the Army air defense command post. RPV employment will be controlled by the divarty commander and will not conflict with other airspace users.

The Outlook. We have discussed what the airspace control managers could do and equipment needs for the future. As we train with today's equipment we set the framework for the transition to a modern fleet of helicopters. It should be apparent from considering current technological and doctrinal trends that tactical instrument procedures will become an increasingly important facet of the Army's total doctrine for deployment of aviation assets. A review of applicable FMs and SOPs should give aviators an idea of the types of detailed planning and inflight skills which may be required of them in maintaining their all-weather capabilities. Our new UH-60 Black Hawk and CH-47D Chinook aircraft are equipped with the preferred stabilization equipment to help reduce the pilot's workload. However, air traffic control facilities do not have the modern state-of-the-art equipment necessary to provide positive control service from their FOC/FCCs. And new equipment would probably reduce the controller's workload. As procedures are refined and equipment improved it will further enhance our aviation worth to ground commanders as they fight the combined arms battle, and we will be capable of winning in any weather condition, day or night.

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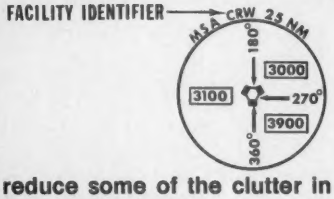
ATC ACTION LINE
UNITED STATES ARMY COMMUNICATIONS COMMAND

Gonna Flip, Flop And . . .

CHANGES TO FLIGHT information publication (FLIP) and other aeronautical products are occurring with regularity. Numerous revisions have been agreed to for the near future. This article covers some of the more recent changes, near-future changes and long-range plans for improvement.

Recent Changes:

• Minimum sector altitude depiction on instrument approach procedures is being changed as follows:



This should reduce some of the clutter in the plan view portion of the chart.

• The lighting legend in the back of the approach book has been modified slightly. Many of you may have noticed that the symbol B, meaning U.S. Configuration (B), is missing. With the limited space for the lighting legend, all systems cannot be depicted. Although some Army airfields do have the U.S. Configuration (B), the ODALS (omnidirectional approach lighting system) is becoming more popular and we felt it should be depicted instead. TM 95-226, "TERPS Manual," contains all of the approved systems and their configurations. Also, the small airport sketch does give a hint as to the lighting system layout.

• Terminal radar service areas (TRSAs) and military training routes (MTRs) are being published on Sectional Charts. However, do notice that sectionals are only published every 6 months and MTRs can change every 56 days. Army aviators are still required to refer to Area Planning (AP/1B) for current routes and check with the flight service station for status.

Near-Future Changes:

• The instrument flight rules (IFR) en route supplement will be split into at least two books. Airfield data only will be contained in the new supplement product; procedural data, possibly lighting legends and other stable type data, will be placed in the second book, called the Pilot Information Handbook. This handbook will probably be issued one per aviator and will be printed biannually since the data doesn't change that frequently. En route supplements will continue to be published on the present cycle.

• The present nine volume Terminal Low Altitude Procedures books will be increased to 12 volumes. When this occurs all radar informtion will be removed from the supplement and placed in the front of each low book. Airport diagrams (full size pages) of the more complex airports also will be included. Latitude/longitude grids for updating inertial navigation systems will be depicted on the diagrams.

• A separate five volume product will be published that will contain those Department of Defense and civil IAP (instrument approach procedures) for airfields with hard surface runways 5,000 feet or greater and having a weight bearing capacity of T-60 or greater. Airfields qualifying for the five volume also will be contained in the 12 volume product.

• Improved binding to increase product life will come with the 5/12 products. Higher quality paper is being considered also.

Long-Range Planning: Improved display of flight information is under study. Emphasis is being placed on microfilm, microfiche, filmstrips and cathode ray tubes. State-of-the-art equipment using microfiche and microfilm already is available. Concepts have been developed and initiation of procurement action for research and development prototypes should be underway shortly.

Readers are encouraged to address matters concerning air traffic control to:

Director
USAATCA Aeronautical Services Office
Cameron Station, Alexandria, VA 22314

Annual Writing Awards

July

Aviator Management
MAJ William B. Leonard III

August

Tracking and Balancing Helicopter Blades
Claud C. Ruthven

September

Suddenly There's a Valley
CPT Robert B. Robeson

First Place — MAJ Samuel C. Raines

October

Hi, I'm a Distraught Flight Simulator
MAJ Michael F. McGaugh

November

"Why Not"
LTC Matthew R. Kambrod

December

The Hind—Myths and Facts
CPT Carl E. Daschke

Second Place — MAJ Michael F. McGaugh

January

How to Fight Helicopters—Soviet Style
CPT Carl E. Daschke

February

SEAD and the 2-Minute Drill
CPT Demetrio J. Tehero

March

The Claw of the Bear
MAJ Frank Babiasz and
CPT Carl E. Daschke

Third Place — LTC Matthew R. Kambrod

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